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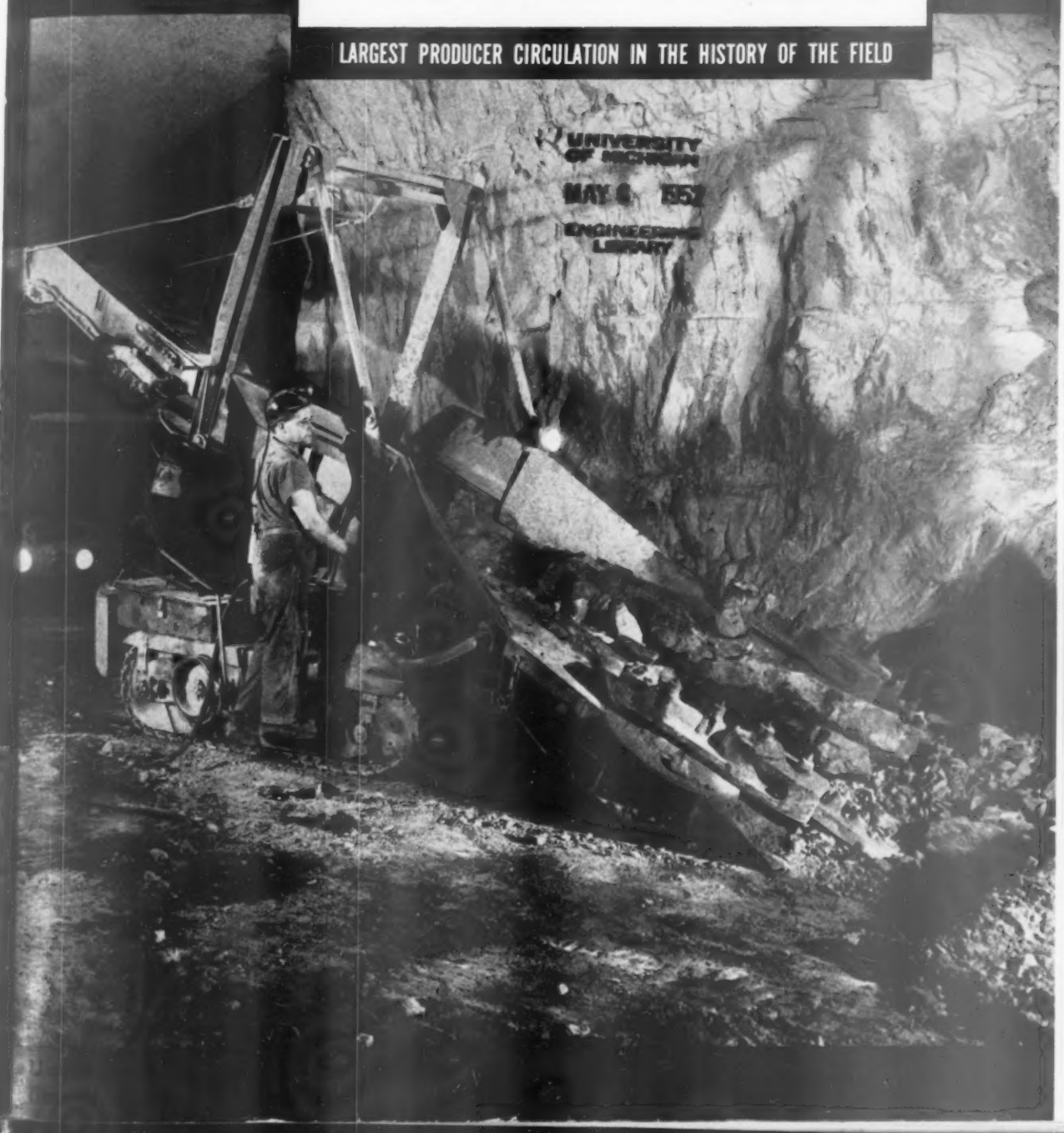

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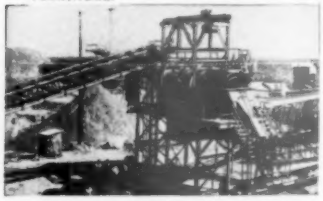

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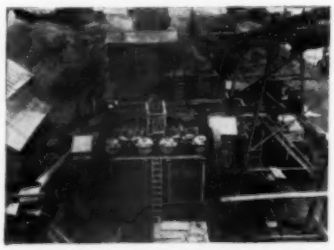

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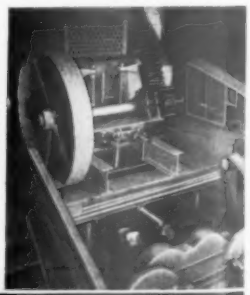

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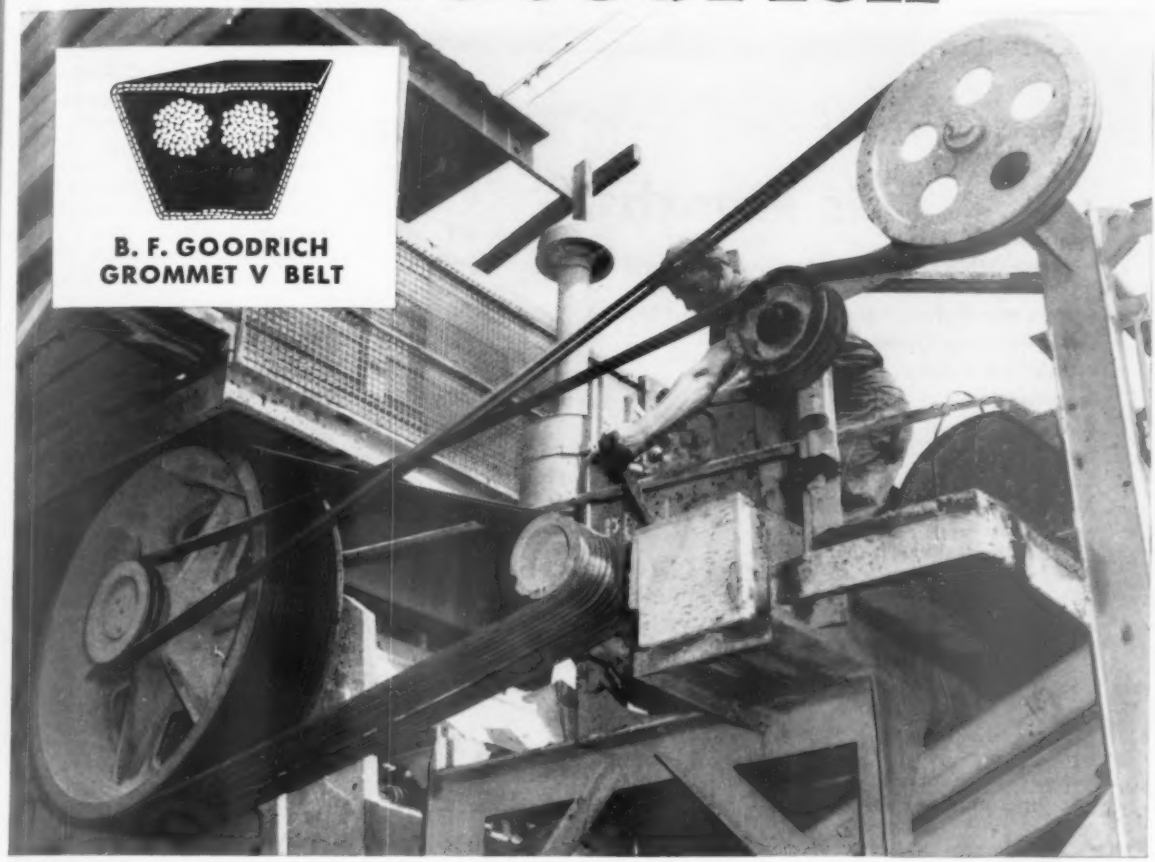

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RUBBER FOR INDUSTRY

APRIL, 1952

ROCK PRODUCTS

THE INDUSTRY'S RECOGNIZED AUTHORITY

VOL. 55, No 4

Bror Nordberg
Editor

Nathan C. Rockwood
Editorial Consultant

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"WE HEAR..."

April, 1952

In less than 40 years, since the first income tax law was imposed by Congress, the corporate income tax rate has risen from 1 percent to a combined normal, surtax and excess profits marginal rate of 82 percent, as was recently reported in Manufacturers Record. During the same period, the individual exemption has shriveled from $3000 at 1913 values to $600 at 1951 values, and the number of individuals subject to income taxes has risen from less than 400,000 to 55,000,000. Also within this 38-year period, Congress has passed 40 major revenue acts and some 300 miscellaneous revenue statutes, adding complexity and confusion to the enormous tax burden.

* * * * * * * * *

The Research and Development Board, Department of Defense, predicts that total research and development expenditures in the United States during 1952 will be approximately $2.93 billion, of which $1.64 billion will be from government appropriations. The use of funds by types of institutions was listed as: $1.82 billion by industry; $830,000,000 by government; and $280,000,000 by universities. This represents an increase of about 13 percent over 1951 expenditures.

* * * * * * * * *

Missouri Pacific Lines reports that the average revenue received by the American railroads for hauling a ton of freight and transporting one passenger one mile has changed little during the past 30 years. For hauling a ton of freight one mile, the railroads received 1.275 cents in 1921; in 1951 (first nine months), 1.324 cents. For transporting a passenger one mile in 1921, they received 3.086 cents; in 1951 (first nine months), 2.589 cents.

* * * * * * * * *

Construction contract awards in the 37 states east of the Rockies for the first two months of the year totaled $1,787,297,000, or 18 percent less than the corresponding period of 1951, according to an F. W. Dodge Corp. report. Nonresidential contracts in February were down 16 percent from January figures and 30 percent lower than February, 1951, while residential awards were up 17 percent from January, but were 25 percent lower than February, 1951. Public and private works were down 9 percent from January, but 5 percent higher than February a year ago.

* * * * * * * * *

The U.S. steel industry produced 105,134,553 tons of ingots and steel for castings in 1951, which was the greatest annual production record in history, exceeding the 1950 output by 8,300,000 tons. It was 17,300,000 tons over the average annual production of World War II. Total annual capacity, which has risen 4,300,000 tons, is now 108,587,670 tons. A considerably larger increase is scheduled for 1952 and, in 1953, annual capacity is expected to reach 120,000,000 tons.

* * * * * * * * *

The constitutionality of New York State's weight-distance tax law was recently upheld by the State Supreme Court, after trucking firms had challenged the law. The trucking firms are expected to appeal the decision; they hold the law is unconstitutional because it discriminates against larger vehicles. The big-truck tax law was passed by the 1951 legislature as a part of Governor Dewey's program to levy on vehicles weighing more than 18,000 lb., a larger proportionate share of the cost of state highways.

WE HEAR

Great Lakes shipments of limestone, coal, iron ore and grain reached a total of 189,750,171 net tons during 1951, breaking all previous records, according to figures recently released by the Lake Carriers' Association. Limestone shipments totaled 25,871,319 net tons, also an all-time high.

* * * * * * * * * *

A truck-weight bill which would have allowed trucks to carry heavier loads over Pennsylvania highways was vetoed by Governor John S. Fine. The bill, which was supported by truckers and opposed by railroads, would have raised the load ceiling on trucks from 45,000 to 60,000 lb. The bill also would have provided new standards for minimum braking and engine performance, as well as graduated fines for violators.

* * * * * * * * * *

Rich uranium deposits have been discovered in Sweden, as was recently announced by an atomic energy government official. The uranium was found in shale deposits near Stockholm, which contained about 175 grams of uranium per ton of shale. In some samples, the uranium content ran as high as 3000 grams per ton.

* * * * * * * * * *

The Michigan Regional Enforcement Commission of the Wage Stabilization Board recently levied penalties totaling $80,000 against an eastern construction company, which violated W.S.B. regulations by paying over-ceiling wage rates to bricklayers, as was reported by Engineering News-Record. This was the nation's first major contested violation charge that went to formal hearing, and an enforcement attorney stated that the decision is "only the beginning" of the enforcement program.

* * * * * * * * * *

The Interstate Commerce Commission estimates that gross capital expenditures by the railroads for the first quarter of 1952 will amount to $359,500,000, or 27.4 percent above the expenditures for the same quarter in 1951.

* * * * * * * * * *

Most manufacturers of scientific instruments should have their biggest sales year in 1952, as was predicted by J. Claire Evans, president of Scientific Apparatus Makers Association. Sales in 1951 exceeded those of 1950 by about 40 percent. Although part of the increase is due to the defense program, the most important factor is attributed to the greater emphasis being placed on both research and production control.

* * * * * * * * * *

A "clean-car campaign" by the Clean-Car Committee of the Mid-West Shippers Advisory Board urges all shippers and receivers of freight to clean all freight cars after unloading them. The committee points out that railroad costs for cleaning cars, like other operating costs, are ultimately reflected in the freight rates shippers pay for the transportation of their goods. Also, it causes delays in switching cars to and from cleaning tracks, a situation that aggravates car shortages.

* * * * * * * * * *

Contract awards for heavy construction totaled $2,281,872,000 for the first ten weeks of 1952, compared with a total of $3,148,923,000 for the comparable period of 1951, as reported by Engineering News-Record. Private housing awards, with a total of $515,400,000, led all other award categories and were 20 percent ahead of the same period last year.

* * * * * * * * *

A ten-year plan for the improvement of the nation's highways has been presented to congressional committees by officials of the American Road Builders' Association. An annual expenditure of $3,000,000,000 over a period of the next ten years was recommended, which is considerably more than was contemplated in either the bill for $400,000,000 a year introduced by Representative Buckley of New York, chairman of the House Committee on Public Works, or the $600,000,000 a year introduced by Senator Chavez of New Mexico, chairman of the Senate Committee on Public Works. The A.R.B.A. officials stressed the need for a definite program which would recognize the appalling state of the highways and permit long-range planning on reducing the $32,000,000,000 debit in road modernization.

THE EDITORS

Editor's page . . . .

What Is Best Fineness for Agricultural Limestone?

The matter of physical and chemical specifications for liming materials is a subject which requires evaluation in the light of what actually takes place in the soil when liming is applied.

Most of the thinking, up until recently, has been that the chief purpose of liming is to correct soil acidity, and most specifications are written with that objective in mind. As a result, we have differing requirements between the various states and geographic regions, based almost entirely on calcium carbonate equivalent and fineness of product, which reflect the combinations that are supposed to yield best neutralizing results economically.

Liming for Nutrients

Recently, more recognition is being given to the function of carbonates in supplying calcium and magnesium to nourish plant growth, and much evidence is being accumulated proving that limestone has importance as a fertilizer. It may well be that the great benefits obtained from liming are due to the part limestones have in supplying calcium and magnesium and in mobilizing other essential chemical elements for plant consumption rather than because of value in neutralizing acid.

Specifications are largely tied to neutralizing value but the finenesses, or surface areas, sought do have relation to the rate of take-up of calcium and magnesium. Fine fractions will quickly supply these elements as plant nutrients but the question has been raised as to whether emphasis on fines, for the purpose of soil neutralization, is best for continued plant nourishment.

William A. Albrecht, Department of Soils, University of Missouri, in an article, "Plant Nutrition and the Hydrogen Ion: V. Relative Effectiveness of Coarsely Ground and Finely Pulverized Limestone," which was published in *Soil Science*, summarized experiments which suggest that grinding might not be best evaluated on the percentages passing through the finer sieve sizes. His experiments have proved to his satisfaction that the function of liming is to supply calcium and magnesium as nutrients and he evaluates fineness on that basis.

Corn yields in trials where 10-mesh and 100-mesh limestones were applied at different rates to clover grown as green manure for corn were such as to prompt consideration of the mechanisms by which a mineral nourishes plants.

His data show that relatively coarse limestone, 10-mesh and down, applied at the rate of two tons per acre at long intervals (1936-1944), was relatively better as measured by corn yields than 300 or 600 lb. of either 10-mesh or 100-mesh material applied four times or every other year. Since calcium in soluble calcium sulfate or calcium chloride had beneficial fertilizer effects, which did not exceed those from application of 300 lb. of 10-mesh limestone, it was concluded that inincreased plant yield was due to the fertilizing value of limestone and not to neutralizing effects.

Excess Neutralization?

Dr. Albrecht theorizes that we do not want to neutralize the soil but rather that some acidity in spots is essential for the plant to obtain phosphorus, iron and manganese, which are made insoluble in alkaline salts. Coarser particles of limestone, by dissolving slowly, provide calcium to roots of the plant at a regulated rate but leave acid spots for other plant roots to seek out in the take-up of other needed elements.

Analysis of his results, which show that a coarser product produces more corn, suggests to him that a slower delivery of nutrients from the breakdown of larger particles may be a more optimum rate for the delivery of calcium than is the saturation of clay by quickly acting calcium salts or by quickly dissolving 100-mesh limestone.

He thinks that acidity is necessary in the soil for nutrients to weather out of reserve minerals, be passed to and stored on colloidal clay and held there in exchangeable forms from which advancing roots can take their requirements. A few foci of less soluble limestone (coarse material) would supply calcium but not make too uniform a soil for best results. He believes that intermixing of fine ground limestone presents the danger of neutralizing the entire soil with calcium and overloading it with a single element.

Many other agronomists advocate thorough mixing of higher surface area limestone throughout the entire soil zone in which the plant roots are expected to extend. They seek rapid "neutralization" throughout the zone.

Dr. Albrecht favors a 10-mesh mill-run limestone. If new state liming laws under consideration are enacted, what should determine fineness requirements?

Bror Nordberg

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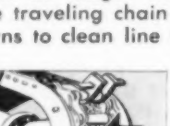

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Rocky's NOTES

Nathan C. Rockwood

Portland Cements - Old and Present

UNDER THE HEADING "Some Unsolved Problems," in the January, 1952, issue of the *ASTM Bulletin*, the monthly magazine of the American Society for Testing Materials, A. T. Goldbeck, chairman of the subcommittee for research on aggregates and concrete, presents this problem: "Portland cement concrete is the most commonly used structural material where known strength and adequate resistance to the disintegrating forces of natural exposure are important factors. The present state of knowledge enables the engineer adequately to design for strength. It does not make full provision for designing for adequate durability where severe weathering exposure is encountered."

That is a realistic summary of results of some 40 years of concrete research. The great bulk of concrete construction must be designed "for adequate durability where severe weathering exposure is encountered," in pavements, dams, bridges, etc. Yet we have no definition of "adequate durability." Much concrete was once sold for *permanent* construction. There was reason to believe it would be at least as durable as most of nature's rocks. However, none of these is really *permanent;* it was expecting too much of concrete to fulfill that specification.

Much concrete used for concrete pavements since 1916 may still be good concrete, but the pavements are outmoded and in many instances the concrete has failed, not because of its faults as concrete, but because of lack of adequate foundation and as a result of over-stressing by far heavier wheel loads and faster traffic than the designers anticipated. Dams built since 1930 have shown signs of disintegration of concrete, but is this necessarily the fault of the concrete, or was it poor design, or faulty construction methods? Designers of concrete have always known that a minimum of water in the mix made stronger concrete and sounder concrete. A sound concrete is a durable concrete, and all evidence points to water as the chief factor affecting durability of concrete; that is, the water retained indefinitely in the concrete from the original mix, and also exterior water that finds its way into concrete after it has hardened. We hope to prove in subsequent articles that the two are intimately related.

Questions To Be Answered

Mr. Goldbeck, who is also the newly elected president of the American Concrete Institute, in the article already referred to, poses these four questions:

"1. What is the mechanism which causes the failure of portland cement concrete under normal outdoor exposure to weathering action?

"2. What characteristics of the cement and aggregate, physical and chemical, affect resistance to weathering?

"3. What are the effects of construction practices, handling, placing, finishing and curing, upon concrete durability?

"4. What are the chemical and physical reactions which cause concrete failure with certain cement aggregate combinations?"

We believe the simple answer to all these questions is: "The relative ability or capacity to retain water in the interior of the material." And that answer covers good and bad aggregates as well as concrete.

Cements Have Changed

Bulletin 39 of the Research and Development Laboratories of the Portland Cement Association, just issued, is a reprint of a paper before the annual convention of the A.S.T.M. last June. Its title is: "Changes in Characteristics of Portland Cement as Exhibited by Laboratory Tests over the Period 1904 to 1950." The authors are H. F. Gonnerman and William Lerch, and they have accomplished an exceedingly valuable base for further exploration and research on cement. If now we can relate the characteristics of some of these cements to contemporary concrete made with them, we may be able to draw some valuable inferences. To be sure, surviving structures made with cement, manufactured say prior to 1926, and there are many, have been conditioned by many other factors than the cement, yet it should be possible, it seems to us, to gain many helpful ideas *regarding the cement factor* by thorough study of these structures.

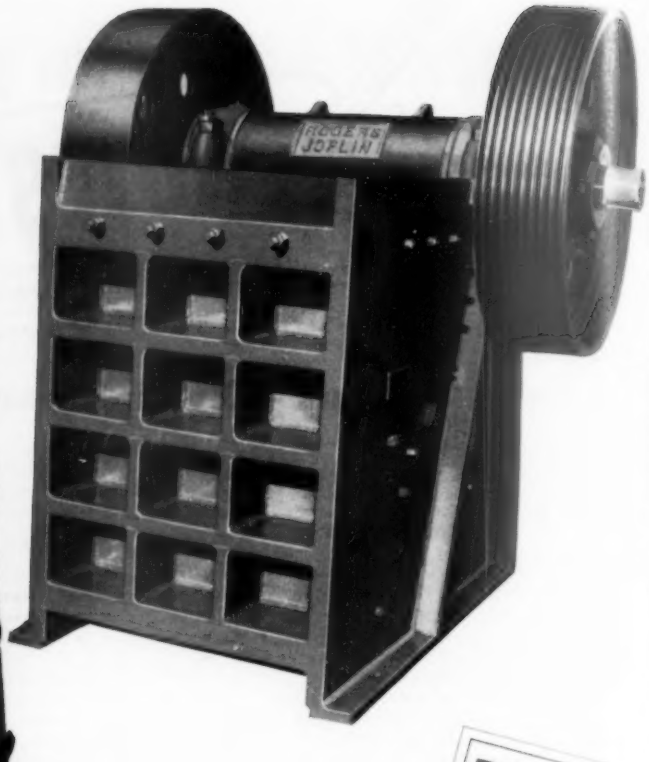
The comparison of old and present-day cements, as shown by charts on page 3 of the bulletin, demonstrate clearly that there has been little change in the ignition loss, the MgO, the Al_2O_3, the Fe_2O_3, the SO_3 or the insoluble residue in portland cements from 1918 to 1950. There has been, on the average, a decrease of about 2 percent in the silica (SiO_2) and an increase of about 2 percent in the lime (CaO). This change in composition was accompanied, starting about 1930, by harder "burning" of the clinker and a jump of about 20 percent in the calculated tricalcium silicate (C_3S) and a decrease of something more than 10 percent in the dicalcium silicate (C_2S). It is true that a few cements prior to 1930 had as high calculated C_3S as present-day cements, but most of them had about 20 percent less. The chart also shows that there has been a slight tendency since 1943 to reduce the C_3S content. It may not be fair to assume that these few earlier "high-limed" cements actually had more C_3S, for it was the custom then to "season" or expose the clinker to weather before grinding, which might have made them analyze relatively high in lime content, but some of the lime may already have been hydrated to $Ca(OH)_2$ rather than combined as C_3S, without showing an appreciable increase in the loss on ignition.

The older cements were much less finer ground, were in general slower setting, required less water for normal consisteney, therefore "bled" more, and consistently showed lower strengths in test specimens, at all ages. This increase in strength in later cements was clearly shown to be due to finer grinding and the increase in C_3S content. If it were generally accepted, as was actually the case, that the stronger the concrete, the more durable it must be, we can readily understand the pressure from all sides for the development of the kind of portland cement we have today. Whether that can now be considered a step in the direction of more durable concrete under severe weathering exposure is certainly open to question in the light of present knowledge and experience.

It is a simple fact of surface chemistry that the finer the particles of a material, or the greater its surface area, the more water it will take up and hold; or in another way of stating the case, the more the material will "swell." Every aggregate producer is familiar with this phenomenon of the bulking of sand. Cement grains bulk in the same way, only much more so because most of the cement grains are reduced by so-called "solution" to particles of colloidal size having enormous surface areas. Moreover, some of the water which surrounds the cement particles is actually chemically bound to one

(Continued on page 148)

ROGERS BUILDS 'EM tough



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- VIBRATING SCREENS
- LIVE ROLL GRIZZLYS
- UNDERGROUND LOADERS
- MINE HOISTS
- DRILL JUMBOS

ROGERS IRON WORKS COMPANY
Joplin, Missouri

LABOR RELATIONS TRENDS

Clear-Cut Decision on Secondary Boycott by Ohio Supreme Court

By NATHAN C. ROCKWOOD

THE SUPREME COURT OF THE STATE OF OHIO, on February 13, 1952, rendered a decision in the case of a subcontractor hauling gravel with nonunion employes against the local of the International Brotherhood of Teamsters, Chauffeurs, etc., which probably will have a bearing on all such disputes. It contains a clear-cut distinction between unlawful secondary boycotts and legitimate picketing and walkouts by labor unions on construction jobs. It involves a situation that frequently arises, or may arise, in the cases of suppliers of construction materials, such as our rock products producers. He was hauling pit-run gravel for filling in on a building site, as the subcontractor to another subcontractor. His truck drivers were not unionized because they chose not to join the union. Their employer took the position that it was not within his province to persuade or coerce them into joining the union.

The case was brought by Anderson Sons Co., the subcontractor hauler, against the teamsters' union in an appeal from an adverse decision in the Court of Appeals, which had reversed a decision of the lower court—the Common Pleas Court of Franklin County—and had thus denied an injunction against picketing a construction job to compel the plaintiff (Anderson) to use union teamsters or quit the job. Under pressure of the teamsters' union, with the cooperation of the building trades unions, the prime contractor and his grading subcontractor, who employed Anderson, were forced to cancel the contract with Anderson in order to proceed with the construction of a hospital building on the campus of the State University of Ohio. The prime contractor was the James I. Barnes Construction Co., and the grading subcontractor H. W. Holt & Son Co., by whom the gravel hauling subcontractor Anderson was employed. Incidentally, the court case began early in 1949.

Facts in Case

The teamsters' union would appear to have the city of Columbus pretty well sewed up, since it included independents who owned their trucks as well as employed drivers. However, in spite of its best efforts it had been unable to organize the Anderson drivers after some two years work on them. Hence it was decided to use the high pressure method, and in February, 1949, the prime contractor, Barnes, was told by the union to stop Anderson from making any further deliveries unless he employed union drivers, or the job would be "bannered"—that is, a picket would carry a banner for the purpose of causing the building trades unions members to walk off the job. The order was not complied with and a walkout followed.

Holt, the grading contractor, then tried to find qualified union truck drivers, but was unable to get them, so Anderson was permitted to resume deliveries with his nonunion drivers. In a few days the walkout of building trades unions members was repeated, and Barnes was compelled by the union bosses to serve Holt with a written order to dispense with Anderson's nonunion services as a haulage subcontractor. Anderson then took his case into court and got a temporary injunction from the lowest court, whose decision went at once to the Court of Appeals with the understanding that the higher court would decide only on the evidence submitted in the court below. The Court of Appeals reversed the decision of the lower Court of Common Pleas and denied the injunction. The Ohio Supreme Court was therefore placed in the position of having to dig out the fundamentals of the law involved. It did so in a very complete and revealing way.

Supreme Court Decision

The union bosses, as usual in all such actions, claimed that there was no conspiracy, no pressure on the contractor, that the union was merely exercising it constitutional right of free speech to let the public know that Anderson did not employ union truck drivers. That the members of the building trades unions walked off the job was, the union bosses contended, merely the voluntary act of individuals who did not wish to work with nonunion men. The first matter to be decided by the Supreme Court was therefore whether the plan adopted by the union bosses was in fact designed to exert pressure upon the members of the several building trades unions employed on the job to bring about a concerted work stoppage and thus cause Barnes, the general contractor, to order Holt, his subcontractor, to order cancellation of the Anderson subcontract for gravel hauling; and, if so, whether such concerted plan constituted unlawful interference with the rights of the plaintiff (Anderson).

The court said: "At the outset, it is appropriate to observe that the subject matter of this action does not involve a labor controversy between the plaintiff and the local union, because the record discloses that Anderson never interfered with the right of his employes to join the union, but took the position that membership in the union was a matter for determination of the employes alone. It does not involve a controversy among Anderson, his employes and the members of the public as patrons or customers of Anderson. It does not involve a controversy between Anderson and Barnes, the general contractor, or between Anderson and any of the subcontractors or members of the union who are employes of Barnes, Holt, or any other subcontractor. And, lastly, it does not involve a controversy between Barnes or Holt and the members of the several craft unions made parties defendant to this action. There was no claim or evidence to support one that there was any contract between Barnes and any of the unions involved wherein Barnes agreed that it or its subcontractors would employ only members of the local union on the construction project."

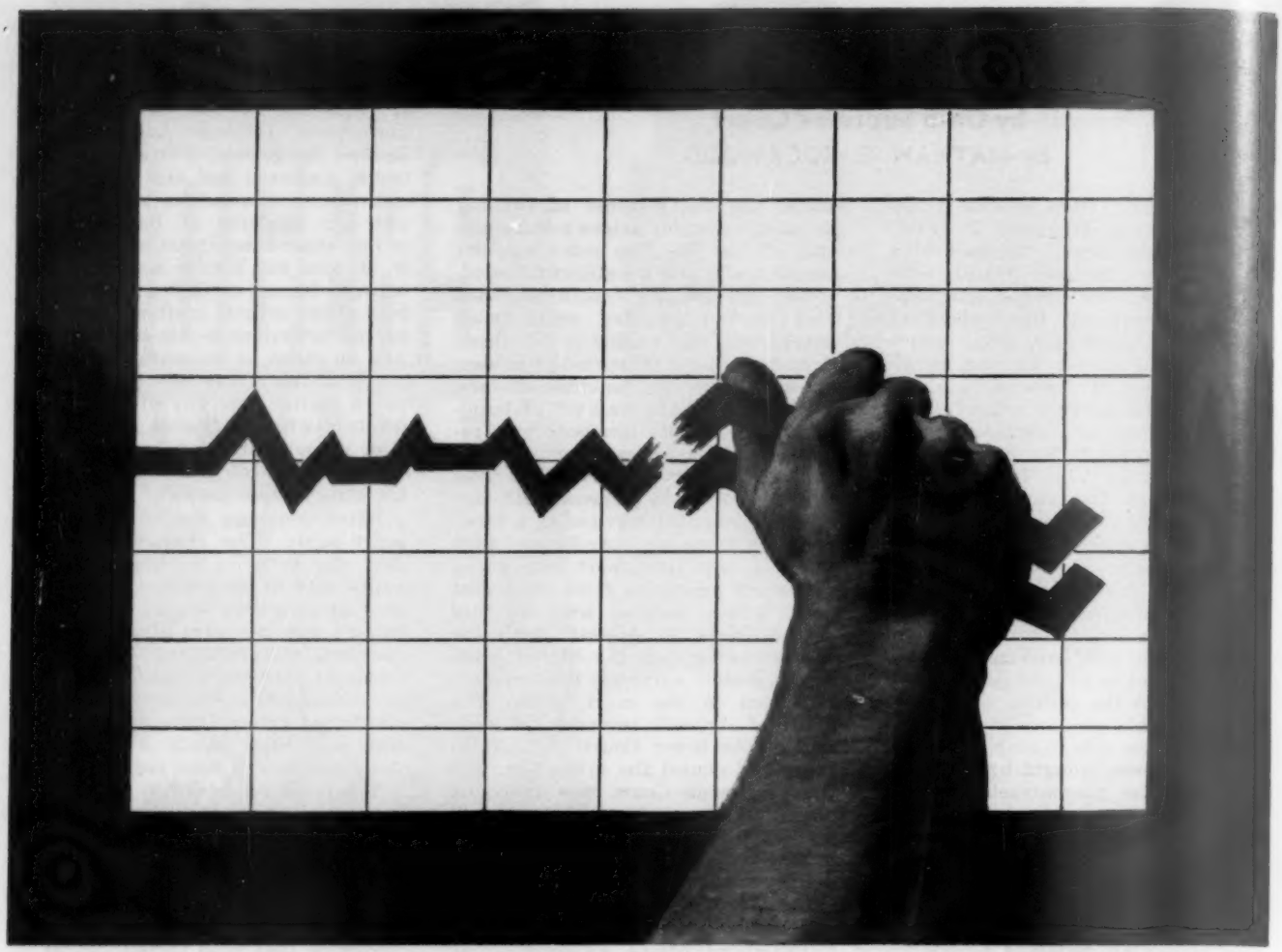
After weighing the testimony the court said: "The character of conduct and behavior as well as its legality may be determined by its purpose as shown by words, acts, implications and the logic of all the surrounding circumstances. It is quite apparent that the prime objective of the defendants in the situation was to secure the unionization of Anderson's men and thus secure a completely unionized construction project."

The court proceeded to give a very interesting historical resumé of the changing attitudes of the courts on the matter of "peaceful picketing," quoting many decisions in both state and federal courts, including the U.S. Supreme Court. The substance of this review is that with the enactment of liberal labor laws, the courts showed a tendency toward liberal interpretations of the "free speech" arguments of labor unions. Then, in fairly recent years, this point of view has changed, led by the U.S. Supreme Court "to a recognition of rights in certain instances which would warrant an injunction against picketing or bannering not withstanding the constitutional protection of free speech." Specific cases are reviewed.

In this review, an opinion written by Mr. Justice Frankfurter, in a U.S. Supreme Court decision (4 to 3) is quoted as follows: "Does the 14th Amendment of the Constitution bar a state from use of the injunction to prohibit the picketing of a business conducted by the owner himself without employes in order to secure compliance by him with a demand to become a union shop?" It may be recalled that this is the way the teamsters union has compelled independent truck owners to join up. The U.S. Supreme Court in the decision quoted, answered the query in the negative, and held that, "while picketing has an ingredient of communication, it cannot dogmatically be equated with constitutionally protected freedom of speech."

After citing recent U.S. Supreme Court decisions in similar building trades unions cases the Supreme

(Continued on page 114)



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PEOPLE in the news

Secretary-Treasurer

RICHARD L. DAVIS, formerly secretary of the Industrial Mineral Wool Institute, has been appointed secretary-treasurer of the Perlite Institute, New York, N.Y. Mr. Davis has had

Richard L. Davis

many years of experience in engineering and association management. As secretary of the Industrial Mineral Wool Institute, he was responsible for the establishment of the industry's product certification program and the publication of many standards and specifications by the Bureau of Standards, American Society for Testing Materials and the Technical Committee on Heat Insulations of the Federal Specifications Board. Previously he was associated with the management engineering firm of Stevenson, Jordan and Harrison, where he served as a statistician and later in various executive and managerial capacities.

General Manager

FRED H. STEWART, formerly general superintendent, has been named general manager of Southwest Potash Corp., Carlsbad, N.M., and W. Aubrey Smith has been appointed assistant general manager. Ross M. Durland has been made plant superintendent, and Norman Prudent has been appointed mine superintendent.

Mr. Stewart is a graduate of Texas College of Mines, El Paso, Texas, and has had a wide background in mining and geological work. He became associated with American Metal Co., Ltd., the parent company of Southwest Potash Corp., in 1941 as geologist and later was placed in charge of all Western exploration, subsequently becoming general superintendent. After three years' service in the Army, he joined Southwest in 1949, after having served previously as an engineering consultant in the potash field.

Mr. Durland was formerly assistant production manager of American Potash and Chemical Corp. at Trona, Calif. He is a graduate of Whitman College, Walla Walla, Wash., with a degree in chemistry.

Mr. Prudent has been a pioneer in coal mechanization since 1924 and has been active in the mine safety movement. He joined Southwest Potash Corp. after 33 years in the coal industry. He was formerly general manager for Hanna Coal Co.

Association President

DAVID J. WARSAW, president of Hay-Con Tile Co., Detroit, Mich., has been re-elected president of the Concrete Products Association of Detroit. Other officers re-elected are Benjamin Wilk, Standard Building Products Co., vice-president; Al Frink, Frink Concrete Products Co., secretary; and Martin Kostere, United Block Co., Inc., treasurer.

Elected President

GORDON H. CHAMBERS has been elected president of Foote Mineral Co., Philadelphia, Penn. He succeeds H. C. Meyer who was recently appointed chairman of the board. A graduate of the University of Pennsylvania, Mr. Chambers joined the company in 1928 as a sales engineer. He was elected vice-president and treasurer in 1936 and executive vice-president in 1951.

Gordon H. Chambers

Executive Vice-President

CARL D. FRANKS has been appointed executive vice-president of the Portland Cement Association, Chicago, Ill. He has been vice-president for promotion since 1948. Mr. Franks joined the P.C.A. staff in 1916 as district engineer in charge of the Indianapolis

Carl D. Franks

office. Eight years later he was appointed Midwestern regional manager, and in 1948 he became vice-president for promotion. Mr. Franks is a graduate of Purdue University where he received his B.S. degree in civil engineering.

Chief Chemist

ROY R. DREHER has retired as chief chemist and inspector at the Hudson, N.Y., plant of Universal Atlas Cement Co., New York, N.Y., after 39 years of continuous service. He will by succeeded by John B. Stark, assistant chief chemist and inspector. Mr. Dreher joined the Hudson plant as a physical tester in 1913. Three years later, he was promoted to chemist, and in 1946 was appointed chief chemist and inspector. Mr. Stark was born in Superior, Wis., where he received his elementary and college education. A graduate of State Teachers College with a B.S. degree in chemical physics, he served in the Army from 1940 to 1945. In 1946, he rejoined the cement company as turn chemist at the Duluth, Minn., plant. Two years later, he was transferred to the Hannibal, Mo., plant as chemist, and in 1950 was promoted to assistant chief chemist and inspector. He was transferred to the Hudson plant as assistant chief chemist and inspector in 1951, which position he has held until his present appointment.

California dinner honors N.S.G.A. president-elect Albert R. Shiely. Left to right: Albert Shiely, H. E. Bender, Mrs. Shiely, Robert Mitchell, Mrs. Redmond, Russell C. Graham, Mrs. Best, Carder B. Livingston, Mrs. Akmadzich, H. N. Goodreau, Mrs. Goodreau, Dewey Manning, Mrs. Manning, H. G. Feraud, P. J. Akmadzich, Mrs. Graham, Q. W. Best, Mrs. Mitchell, N. J. Redmond, and Mrs. H. E. Bender

Guests of Honor

ALBERT R. SHIELY, newly elected president of the National Sand and Gravel Association, and Mrs. Shiely were guests of honor at a dinner given for them by members of the board of directors of the Southern California Rock Products Association and their wives on February 19 at the Biltmore hotel, Los Angeles, Calif. Mr. and Mrs. Shiely were on their way to the Hawaiian Islands for a vacation trip.

The southern California hosts were Mr. and Mrs. H. E. Bender, Mr. and Mrs. N. J. Redmond, Mr. and Mrs. Robert Mitchell, Mr. and Mrs. Q. W. Best, Mr. and Mrs. Russell C. Graham, Mr. and Mrs. Carder B. Livingston, Mr. and Mrs. P. J. Akmadzich, Mr. and Mrs. Dewey Manning, Mr. and Mrs. H. N. Goodreau, and H. G. Feraud, executive secretary of the Southern California Rock Products Association.

N.R.M.C.A. President

R. K. HUMPHRIES, who was elected president of the National Ready Mixed Concrete Association at its annual convention in Chicago in February, 1952, was born in Seattle, Wash., and graduated in 1938 from the University of California at Berkeley, where he majored in political science. He joined Pacific Coast Aggregates in 1939 and held various positions at both yards and plants. Four years later he transferred to the transportation department, later becoming manager of the department. In 1943, Mr. Humphries joined an air squadron of the U.S. Navy as engineering officer, serving until late 1945.

He returned to Pacific Coast Aggregates as sales manager in charge of ready-mixed concrete. In 1946, he became assistant to the vice-president and general manager, E. J. Goodpastor, and in 1948 he was made assistant general manager. Two years later Mr. Humphries became vice-president and general manager and was elected a director of the company. He served as secretary-treasurer of the National Ready Mixed Concrete Association from 1950 to 1951. He is also a director of the National Sand and Gravel Association.

Harvey Whipple Retires

HARVEY WHIPPLE, secretary-treasurer of the American Concrete Institute, Detroit, Mich., has been named editorial consultant, and Fred F. Van Atta has been appointed acting secretary-treasurer. He has been assistant secretary since 1946. Mr. Whipple, who had served a number of years with the *Detroit Free Press* and *Detroit News* and as managing editor of *Concrete-Cement Age*, became part-time secretary of A.C.I. in 1919. He decided to devote full time to institute affairs and assumed the additional duties of treasurer in 1921. Mr. Whipple inaugurated the *ACI News Letter* in 1920, which became part of the *Journal of the American Concrete Institute* in 1929.

Harvey Whipple

Mr. Van Atta, a native of Northville, Mich., is a civil engineering graduate of Michigan State College. He joined the Michigan Engineering Experiment Station in research on aggregate, and later worked on precise level surveys with the Coast and Geodetic Survey, foundation investigations and early construction phases of Kentucky dam of the T.V.A., and in the development of hydraulic design and hydraulic model studies for the Los Angeles district of the Corps of Engineers. During World War II, Mr. Van Atta served as assistant to

Fred F. Van Atta

the district engineer, Charleston, S.C., in charge of planning and construction of aircraft warning stations, harbor defenses, concrete and timber wharves, and concrete and asphalt paving.

Heads Masonry Division

DALTON F. SPINGLER, sales manager of Duro-Crete Co., East Providence, R.I., has been placed in charge of the new masonry supply division, according to an announcement by Dr. Ercole Addonizio, president of the company. Evelyn V. Vanta has been promoted to office manager, and William Francis has been appointed salesman.

A.R.B.A. Officers

PAUL B. REINHOLD, Pittsburgh, Penn., was re-elected president of the American Road Builders' Association at its Golden Anniversary convention in Houston, Texas, January 24. Other officers are Charles M. Noble, Trenton, N.J., vice-president, Northeastern Division; Charles W. Smith, Pensacola, Fla., vice-president, Southern Division; M. J. Hoffman, St. Paul, Minn., vice-president, Central Division, who replaces W. A. Roberts, Milwaukee, Wis.; and A. Diefendorf, Salt Lake City, Utah, vice-president, Western Division. Jennings Randolph, Washington, D.C., was named treasurer.

Association President

O. H. SEEGER, general manager for Harry Wellnitz, Columbus, Ohio, has been elected president of the Columbus Concrete Block Manufacturers Association. Mr. Seeger, who has been serving as vice-president of the association, succeeds J. Paul Batterson, vice-president of The Cunard-Lang Concrete Co. Kenneth K. King, president of King & Eichenlaub, succeeds Mr. Seeger as vice-president. M. C. Royer continues as acting secretary-treasurer.

Committee Chairman

HARRIS N. SNYDER, president of Federal Crushed Stone Corp., and vice-president and general manager of Buffalo Slag Co., Inc., Buffalo, N.Y., has been appointed chairman of the General Corporations Committee of the Greater University of Buffalo Development Program.

Outstanding Salesman

SAM BUDERMAN, West Virginia district sales manager for Universal Concrete Pipe Co., Columbus, Ohio, recently was named "Outstanding Salesman for 1951." Mr. Buderman was honored at a special dinner of the Columbus Sales Executives Club, as the guest of Thomas H. Monaghan, general sales manager. A. G. Cochran and William Curtiss of the Columbus staff, were co-hosts.

On Board of Directors

H. C. "PAT" MAGINN, executive vice-president of Calaveras Cement Co. and chairman of its management committee, has been elected a member of the board of directors of Transamerica Corp. Mr. Maginn, who has been associated with Calaveras since 1926, succeeds William H. Draper, Jr., who has resigned to accept an important European post with the U.S. government.

H. C. Maginn

Robert F. Hindman

General Manager

ROBERT F. HINDMAN has been named general manager of the new lightweight aggregate division of The Marietta Concrete Corp., Marietta, Ohio, and Robert C. Stelzle has been appointed manager of the precast concrete panel plant. Mr. Hindman will also supervise laboratory research on testing and development of new uses for Beslite, an expanded clay aggregate. He is a graduate of Ohio State University, and has been associated

Robert C. Stelzle

with the Corps of Engineers, the Ohio Highway Department Testing Laboratory on materials testing and aggregate research and was an engineering officer with the U.S. Navy during World War II. Prior to joining The Marietta Concrete Corp., Mr. Hindman was a field engineer with Lehigh Portland Cement Co.

Mr. Stelzle, a chemical engineer, was formerly plant manager of the Cemenstone Corp., Pittsburgh, Penn.

Appointed Treasurer

K. E. DIXON has been appointed treasurer of Preload Company, Inc., New York, N.Y., designers of prestressed concrete structures, according to an announcement by A. W. Brown, chairman of the board.

OBITUARIES

NORMAN G. HOUGH, widely known throughout the lime industry, died March 10. Mr. Hough had the distinction of being the first salaried manager representing the lime industry, having served as manager of the Hydrated Lime Manufacturers' Bureau when it was an organization separate from the Lime Manufacturers' Association. When the National Lime Association was reorganized in the late 1920's, Mr. Hough was appointed president and general manager. After leaving the National Lime Association he became general sales manager of The Kelley Island Lime and Transport Co. He then served as a sales consultant for lime putty during the 1930's when that product was being widely introduced. At the time of his death Mr. Hough was engaged in sales work handling Marchant business machines in Washington, D.C.

CARL PETERSON, retired president of Ideal Cement Stone Co., Omaha, Neb., died recently. He was 73 years of age. Mr. Peterson, together with his brother, N. J. Peterson, organized the company in 1905, and he served as its president from 1928 until his retirement in 1947.

WILLIAM MOELLER, retired general superintendent of the Western division of Lone Star Cement Corp., New York, N.Y., died at his home in Dallas, Texas, following a short illness. He was 75 years of age.

HARRY R. HAYES, executive secretary and engineering director of New York State Crushed Stone Association, Inc., Albany, N.Y., died March 6 at the age of 66. Mr. Hayes was born in Utica, N.Y., and graduated from Rensselaer Polytechnic Institute in 1909. Former city engineer and commissioner of public works in Utica, he had been living in Albany for the past 15 years.

NICHOLAS G. FARBER, owner and operator of Farber White Limestone Co., Franklin, N.J., died recently in the Roger Smith hotel, Washington, D.C., where he had gone on a business trip. He was 56 years old. Mr. Farber was a director and one of the original founders of the National Agricultural Limestone Association, and had just completed service as treasurer. He was also president of the Associated Limestone Producers of the Northeast.

THOMAS STEELE ALLAN, president of Missisquoi Stone and Marble Co., Ltd., Phillipsburg, Que., Canada, died recently at the age of 65.

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industry news

Employes watch as 365th day of safe operation is charted on signboard

Accident-Free Year

HURON PORTLAND CEMENT CO.'S Alpena, Mich., plant recently completed a year of operation without a lost-time accident, which represented a total of 2,011,501 man-hours of safe operation by more than 800 employes. This achievement breaks the plant's previous record of 1943 when it won a trophy and national recognition for operating 1,188,675 man-hours without a lost-time injury.

Canadian Asbestos Plant

CASSIAR ASBESTOS CORP., Toronto, Ont., Canada, is building an asbestos plant near the British Columbia-Yukon border. The company plans to build two mills—one for handling approximately 250 tons of raw material per day from high-grade deposits, the other for processing 400-600 tons of average-grade asbestos per day. The deposits are located on a mountain roughly between the 5000- to 6000-ft. level. A pre-designed town, to accommodate a population of nearly 1000, will be built at McDame Creek, on the Alaskan highway.

Fluorspar Plant

KAISER ALUMINUM AND CHEMICAL CORP. recently announced plans to build a plant for processing fluorspar, a critical mineral used in the production of aluminum metal. The new plant will be built soon on a yet to be selected site in Nevada but which will be accessible to rail and highway transportation.

Some of the fluorspar will come from the recently acquired Baxter mine near Gabbs, Nev., but the mill will be of sufficient capacity to handle additional ore purchased from other Nevada deposits, according to the company.

The Kaiser aluminum operation at present requires approximately 31,000 tons annually of acid grade fluorspar concentrates to produce by-products essential for its plants at Spokane and Tacoma, Wash., and New Orleans, La.

Volcanic Ash

THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH of New Zealand is investigating large domestic deposits of volcanic ash. If the experiments being carried out are successful, New Zealand will begin the production of pozzolan, which will be used as a partial replacement for cement in the production of concrete.

Win Safety Trophies

WARNER CO.'S Bellefonte and Van Sciver plants had an accident-free record for 1951 and were among those in the large-plant group to receive the President's Safety Trophy. In the small-plant group, McCoy and the dredge Franklin also worked the entire year without a lost-time accident. Approximately 570 men at the four Warner plants last year worked a total of 1,398,652 man-hours.

Gypsum Paper Mill

NATIONAL GYPSUM CO., Buffalo, N.Y., has announced the completion of its new paper mill at Pryor, Okla. The plant, designed by National Gypsum's own production and engineering staffs, was completed in ten months and is the company's fourth paper mill. It will supply up to 150 tons of paper liner a day to National's plants at Rotan, Texas; Fort Dodge, Iowa; and Medicine Lodge, Kan. The paper will be used in the manufacture of gypsum lath, wallboard and exterior sheathing.

Expansion Completed

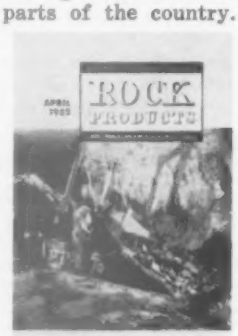
ROGERS LIME AND MATERIAL CO., Rogers, Ark., formerly Lilly White Lime Co., recently completed its plant expansion and is now producing lime, crushed stone and chat. Expansion included the installation of a 50-ton hammermill and a rock crusher with a capacity of 800 t.p.d. William S. Brantingham, owner, has been engaged in the crushed stone business since 1903 and has operated his own quarries since 1915.

Leases Plant

PACIFIC SILICA PRODUCTS CO., Los Angeles, Calif., producer of special sands and lime for the stucco manufacturing industry, has leased the plant and sand deposits at Moorpark, Calif., from Walter J. Saviers. New screening equipment and storage bins are being added to the plant facilties. It is planned to increase present output from 30 t.p.d. to more than 100.

Cover Picture

UNDERGROUND MINES continue to be a major source of agricultural limestone in some parts of the country. Much of the equipment has been designed primarily for underground operations, but some units also offer possible new techniques for quarrying deposits above ground.



Shown on the cover is a Joy excavator and shuttle loader being used in an underground limestone mine in the Middlewest. This piece of machinery is particularly useful in locations with low head room where shovels could not operate.

New A.S.T.M. Publication

THE AMERICAN SOCIETY FOR TESTING MATERIALS has announced the availability of the new A.S.T.M. publication, "Symposium on Thermal Insulating Materials." The papers and discussion included in this volume were first presented at the 1951 spring meeting by Committee C-16 on Thermal Insulating Materials. The booklet provides important data on the components of thermal insulation properties such as specific heat, emissivity, diffusivity, moisture vapor transmission and the effect of moisture on thermal conductivity.

Copies of this 64-page booklet may be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penn., at $1.50 each.

Lehigh Scholarship

LEHIGH PORTLAND CEMENT CO., Allentown, Penn., with a gift of $15,000 has established an endowed undergraduate scholarship at Princeton University, open to any qualified student in any one of the university's departments of study, as was recently announced by Dr. Harold W. Dodds, president of the university.

Marking the first time in Princeton's history that an undergraduate scholarship has been endowed by a corporation, the newly created fund will be known as the "Lehigh Portland Cement Co. Scholarship" and will return sufficient annual income to cover the full cost of an undergraduate's tuition for an academic year. Lehigh imposed only one condition in making awards of this scholarship: that it be used solely and exclusively for providing tuition for undergraduate students in the engineering or liberal arts departments.

President Dodds stated that the gift from Lehigh is another positive indication of the increasing awareness in American business and industry of the financial problems of privately supported educational institutions and that a corporate gift, such as Lehigh's, is of added significance in that it offers strong proof that industry understands the importance of liberal arts training in developing leadership for industry and for the country.

Safety Achievement

DRAGON CEMENT CO.'S Thomaston, Maine, plant recently completed 1000 days of operation without a lost-time accident. The Northampton, Penn., plant had achieved this goal last October. Dragon Cement Co., formerly Lawrence Portland Cement Co., was reported to be the only cement company in the country operating more than one mill to go through 1950 without a lost-time accident. It can now boast a similar record for 1951 and has a fine start for 1952. Plans were made for a big safety celebration.

Gravel serves as porous filter material for earth-fill portion of Meridian dam in Oregon

Gravel Filter

APPROXIMATELY 160,000 CU. YD. of gravel, in sizes below 1½ in., are being used in the earth-fill construction portion of the Meridian dam, 30 miles east of Eugene, Ore., on the Willamette river. The gravel will serve as a porous filter, 30 ft. in width, on each side of the hard clay core of the dam. Power for this phase of the project is supplied by two International UD-24 diesels. Duffy Reed Construction Co. is subcontractor. The project, begun in 1950, is expected to be completed in 1954.

Ohio Limestones

DEPARTMENT OF NATURAL RESOURCES, Division of Geological Survey, Columbus, Ohio, recently announced the publication of Bulletin No. 49, "Limestones of Eastern Ohio," a companion volume to Bulletin No. 42 "Dolomites and Limestones of Western Ohio," issued in 1940.

The 377-page book gives, county by county, a brief picture of the stratigraphic sequence, the character, thickness and distribution of the limestone formations involved, and a detailed study of the composition. Price of the bulletin is $2 per copy.

Portland Cement Production

THE PORTLAND CEMENT INDUSTRY produced 17,039,000 bbl. of finished cement in January, 1952, as reported to the Bureau of Mines. This was a decrease of 2 percent compared with the output in January, 1951. Mill shipments totaled 12,696,000 bbl., an increase of 4 percent over the January, 1951, figure, while stocks were 23 percent above the total for the same month in 1951. Clinker production during January, 1952, amounted to 19,547,000 bbl., an increase of 2 percent compared with the corresponding month of the previous year. The output of finished cement during January, 1952, came from 152 plants located in 36 states and Puerto Rico. During the same month of 1951, 17,434,000 bbl. were produced in 149 plants.

Huron Expansion Delayed

HURON PORTLAND CEMENT CO.'S proposed expansion at the Alpena, Mich., plant is being held up, due to delays in receiving Defense Production Administration approval. Installation of four additional kilns and grinding units are contemplated. Company officials, however, said they had not yet received a necessity certificate from D.P.A., while at the same time, cement companies in other sections of the country have received necessity certificates.

The Huron company has appealed to its customers to advise D.P.A. of the cement shortage conditions in the Great Lakes area. Nearly 700 firms responded with forceful messages directed to D.P.A. in Washington, D.C., among them being Alpena Cement Products Co., which told D.P.A. that in spite of Huron's doubled output during the past ten years, cement rationing is still necessary in that region. Many plants have had to curtail operations or seek cement from other sections of the country, which adds considerably to the cost of the cement.

Coming Conventions

May 8-10, 1952—
National Lime Association, 50th Annual Convention, The Homestead, Hot Springs, Va.

May 15-17, 1952—
National Industrial Sand Association, 17th Annual Meeting, The Homestead, Hot Springs, Va.

May 22, 1952—
Empire State Sand, Gravel and Ready Mix Association, Annual Meeting, Binghampton, N.Y.

June 3-4, 1952—
National Agricultural Limestone Institute, Hotel Sheraton, Chicago, Ill.

June 23-27, 1952—
American Society for Testing Materials, 50th Anniversary Meeting, Hotels Statler and New Yorker, New York, N.Y.

Steel Scrap Program

JOSEPH T. RYERSON & SON, INC., Chicago, Ill., one of the nation's largest steel distributors, has recently inaugurated a plan designed to get stagnant steel and idle equipment into use, or moved to the steel mills as scrap. Steel users are being urged to take an inventory of steel that isn't being used or marked for use and of their idle or discarded metal working machinery and allied equipment, and then decide if they should be sold, kept or scrapped.

To help users dispose of items they are willing to sell, Ryerson has offered to publish, without charge, classified advertisements in its pictorial-type newspaper which is circulated nationally to more than 100,000 firms in various lines of business.

The Ryerson plan is aimed primarily at prying loose unused steel and equipment and getting it into use or, if it is found to be unusable, getting it scrapped. According to a spokesman for the company, the plan has been enthusiastically received and approved by many steel men. It is believed that this effort to free idle steel and equipment will help to relieve the pressure for new steel as well as aid in maintaining a high rate of steel production. By mail, through business advertising and through the personal work of company salesmen, this campaign to "sell it or scrap it" is expected to reach a large segment of American industry.

Sand and Gravel Operation

KIEWIT AND SONS have opened a new sand and gravel operation near Boulder, Colo., to furnish material for the completion of an access road and other roads along the Colorado turnpike.

After 2½-years service, carrying a total of 4,600,000 tons of rock, these 6000 idlers, cleaned and painted for resale, show no signs of wear

Idler Performance

IN THE CONSTRUCTION of Bull Shoals dam on Arkansas's White river, a 7-mile belt conveyor was used for moving 4,600,000 tons of Ozark rock. Out of the original 14,000 idlers that supported the belt, 6000 were recently inspected, cleaned and painted for resale. After nearly 2½ years of service, only four of the 6000 inspected had to be discarded. The others, which were claimed to be "as good as new," were resold to Consolidated Mining and Smelting Co., Waneta, B.C., Canada, under a new idler guarantee, along with conveyor pulleys and motors.

M. H. Slocum, superintendent of the Bull Shoals operation, who selected belt conveyors for the dam project after studying rail, truck and aerial tramway alternatives, stated that there was no apparent wear on the idlers, and that their performance and the low maintenance and operating costs for the whole system fully justified their faith in belt conveyors for projects of that magnitude.

The idlers, designed and manufactured by the Robins Conveyors Division of Hewitt-Robins, Inc., each consist of three tube-shaped rollers which form a flat-bottomed "V". Self-aligning idlers are located at strategic points. Lubrication is required from one side only, thus reducing maintenance time.

Plant Expansion

MIDWEST PRE-COTE CO., Kansas City, Mo., recently purchased additional property near Excelsior Springs, Mo., for expansion purposes. The company has been operating a portable crushing plant, but plans to establish a permanent plant at the new location.

Recently the equipment had been moved to Platte City to provide crushed stone for a by-pass on Highway 71. The mobile plant will operate about three or four months at Platte City, after which it will be returned to the Excelsior Springs site. Plans for a ready-mixed concrete plant are also being considered.

Limestone Company Sold

LLOYD GRIGGS LIMESTONE CO., Edon, Ohio, has been sold to Harold Kaiser, also of Edon. Former owner was Lloyd Griggs.

Pavement Yardage

AWARDS OF CONCRETE PAVEMENT for the month of February and for the first two months of 1952 are listed by the Portland Cement Association as follows:

	Sq. yd. awarded	
	During February, 1952	During first two months 1952
Roads	987,948	2,484,584
Streets and alleys	1,856,458	3,225,913
Airports	878,649	1,500,005
Totals	3,723,055	7,210,502

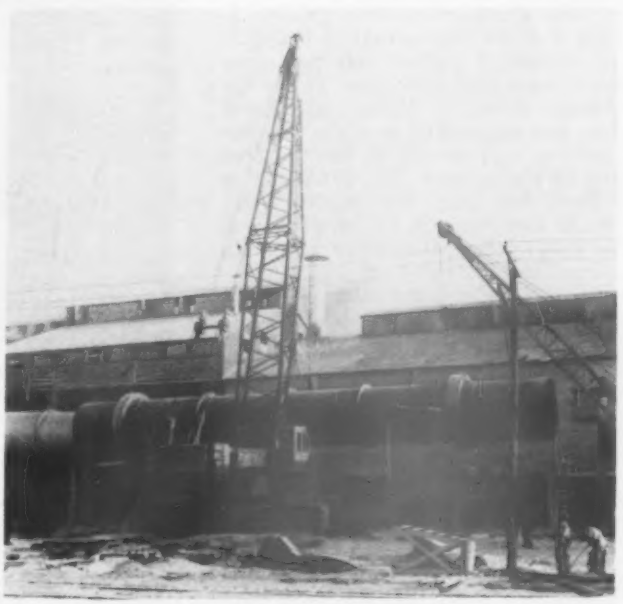
Kiln Installation

THE INSTALLATION of a 340-ft. rotary kiln was recently completed at Medusa Portland Cement Co.'s Manitowoc, Wis., plant. The kiln is a part of the company's expansion program at Manitowoc, for which McDowell Co., Inc., Cleveland, Ohio, has the contract for the erection of buildings and installation of machinery.

By setting the kiln in large sections, it was mounted in only four days. One section, 91 ft. 1¼ in. long, 10 ft. in diameter, and of ⅞-in. plate, weighed 100 tons. Handled by a single crane, it was probably the heaviest lift ever made by a crawler unit.

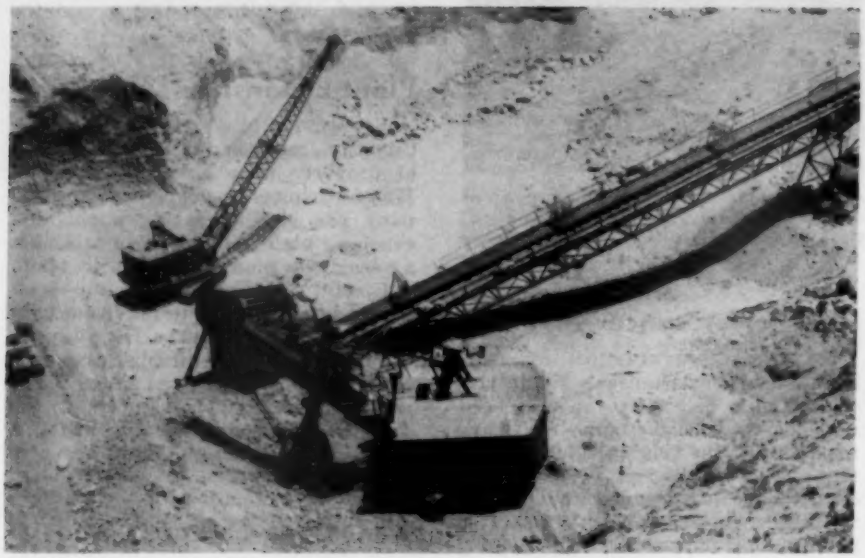
A Manitowoc Model 4500 made the lift at a 20-ft. radius. It was equipped with an 87-ft. all-steel erection boom, and load blocks were rigged to give a 10-part, main load line. The other main line was run from the boom point to a snatch block ahead of the foundation to act as a safety line for the boom at its minimum radius. Foundation pedestals made it necessary to lift the section to the full height of about 30 ft.; the crawler crane then walked the load into its final position. A level roadway of 12- x 12-ft. timbers was made to avoid danger of the load swaying beyond the safe radius.

The other three sections of the kiln were approximately 83 ft. long, with an average weight of 72 tons. These were set earlier by the crane at radii up to 33 ft.



Placing 100-ton section of 340-ft. kiln is done by a single crawler crane

H and H



Grizzly placed over top of feed hopper eliminates oversize; in foreground is 7½-cu. yd. shovel which does the excavating

Pendulum Belt Conveyor

THE USE OF PENDULUM BELT CONVEYORS, although a western development, is becoming a more general practice throughout the United States, as its use permits a wide swath to be cut through the deposit before becoming necessary to move a lot of field belt conveyors. Such a pendulum usually has a feed hopper at the outboard end and a suitable discharge feeder provided.

If the deposit contains gravel too large to be handled with belt conveyors, a grizzly is usually placed over the top of the feed hopper as shown in the illustration. The grizzly is hinged at one edge so that by lifting it up, oversize is cleared from the heavy manganese steel bars used. At the operation shown, a 7½-cu. yd. shovel does the excavating and the smaller crane is kept nearby to lift the free end of the grizzly. The pendulum is a 60-in. belt unit. The smaller dragline is used to stack the oversize and to aid in miscellaneous clean-up around the shovel.

Reclaiming Tunnel

THE CONSTRUCTION of surge piles on the quarry floor is gaining each year and many of the older operations are adding such a system to their plants.

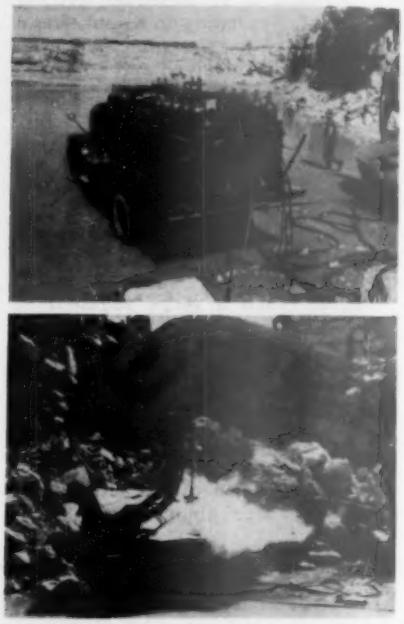
At a midwestern quarry operation, large diameter concrete pipe were used as the supporting walls of the reclaiming tunnel recently installed. Concrete pipe offers many advantages in that it will not rust, has more than ample strength to support any ordinary load of crushed aggregate over it and, if desired, the tunnel can be made watertight. The illustration shows the start of the construction. On this job a 36- x 48-in. Traylor jaw is the primary crusher, with an F-900 Tyler scalper. The transfer station in the center background will eventually play a part in the surge pile assembly.

Concrete pipe as supporting walls of reclaiming tunnel

Portable Jet-Piercing Unit

A MULTIPLE HAND-OPERATED jet-piercing unit, supplied with oxygen, fuel and water from a compact mobile carrier has been developed by Linde Air Products Co., a division of Union Carbide and Carbon Corp., New York, N.Y. A unit of this type, operating in a Canadian quarry, enabled four jet-piercing blowpipes to make blast holes for 2 hr. without shutdown. It has also been used successfully at other quartzite and sandstone quarries.

Employment of the new self-contained unit, which allows up to four operators to produce approximately 450 ft. of blast hole without shutdown, accelerates rock removal operations. It was developed to supplement the large jet-piercing machine but, according to the manufacturer, because of its efficiency, portability and ease of setting up, it could probably be used wherever many shallow secondary blast holes must be made in hard or abrasive rock which is highly spallable. The cost of such blasting is said to be much lower than by mechanical means.



Top: Mobile carrier supplies oxygen, fuel and cooling water. Bottom: Hand jet-piercing blowpipe sinks secondary blast hole in large boulder which remained after primary blast

Normally, only two blowpipes are in operation at one time. Large boulders or ledges, which sometimes remain after primary blasting, can, in the case of certain hard rock, be prepared for reduction far more rapidly with these units than by any other means, it is claimed.

A special feature of the new manual unit is the mobile gas and fluid supply carrier which consists of a standard truck chassis fitted with four standard-capacity oxygen cylinders, a steel holding-tank for fuel oil, and a gasoline-driven air compressor and tank for pressurizing the fuel oil tank. Cooling water for the blowpipes

is supplied to the unit from a hose extension to the quarry supply line. Feeder lines from the oxygen cylinder manifolds and the oil and water tanks terminate in four sets of take-off stations on the control panel at the rear of the truck. One or as many as four blowpipes can be connected to the take-off panel by high pressure rubber hoses whose lengths depend on the extent of the particular quarrying operation.

The hand jet-piercing blowpipe used with the mobile carrier is a portable device which can be manipulated easily by one operator. Standard blowpipe length is 5 ft., but shorter or longer blowpipes may at times be used in specific operatons. The one shown in the illustration is 3½ ft. long and, it is claimed, can produce blast holes at rates up to 60 ft. per hr., depending on the properties of the rock. Deeper blast holes can be made by longer, modified blowpipes. Blast holes can be at any angle from the vertical to the horizontal, making it unnecessary for the operator to drill from the top of the boulder. Hole diameter is held to approximately that which allows the use of a standard 1⅛-in. diameter dynamite charge.

Essentially a process using the exhaust from a small rocket-type motor as the "drill," jet-piercing has been employed for primary blast holes as deep as 31 ft. and as large as 7½ in. in diameter, which can be expanded to a larger size where required. Large jet-piercing machines mounted on tractor carriers are used effectively for primary blast hole production.

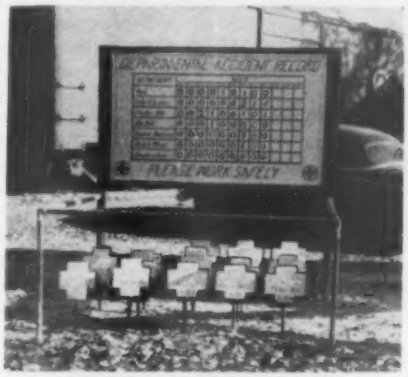
Car Puller

AT A SAND AND GRAVEL operation in the South, a car puller assembly was improvised by taking the Hyster mechanism from a tractor and permanently mounting it as shown in the illustration. The unit, mounted on heavy channel irons, is substantially constructed throughout. The drive is by electric motor.

Car puller made from tractor part

Safety Chart

A LARGE ROCK PRODUCTS operation in the Midwest has a unique system for charting safety progress. A "grave-yard" is enclosed in a metal fence above which is posted the safety records of the various departments. Each man that has been injured has a headstone in the "grave-yard" on which is printed his name, date of accident and the department. The assembly is strategically located so as to serve as a constant safety reminder to all who enter the plant.



A gruesome but effective safety reminder

Cost Comparator

FUEL SAVINGS of diesels as compared to gasoline engines can be quickly calculated in dollars on a cost comparator prepared by Cummins Engine Co., Inc., Columbus, Ind. This slide rule type calculator will allow the power user to determine quickly the economies which can be realized through the use of diesels for all types of applications.

For the truck owner, one scale is

Slide rule calculator determines savings on either mileage or hourly basis

on a mileage basis. The reverse side of the slide rule shows savings on an hourly basis for industrial and marine power users. Diesel fuel-gasoline price differential and the decreased fuel consumption are used for determining the savings.

Belt Conveyor Over Bridge

A LARGE SAND and gravel producer in North Carolina has his screening and washing plant on one bank of a navigable stream, while the deposit is located along the opposite bank. To eliminate the 7-mile haul required in

Material is conveyed across river by belt conveyor

moving the material by truck, the operator built a suspension-type bridge which carries a 500-ft. long, 24-in. belt conveyor, as shown in the illustration. Paralleling the conveyor is a walkway with ample room for inspection and necessary lubrication. The bridge is high enough above the water line to permit barge transportation under it. The two towers shown also act to support electric power lines.

Field Oil Supply

AT AN OPERATION in the Southeast which involves diesel draglines and diesel truck transportation, the supplying of oil quickly and economically to the fleet of units is accomplished by use of a portable field tank mounted on substantial steel sled runners. The tank, shown in the illustration, is about 4 ft. in diameter, 6 ft. long and is provided with a hand pump and a wire rope sling. A tractor is used to move the oil sled to the various locations.

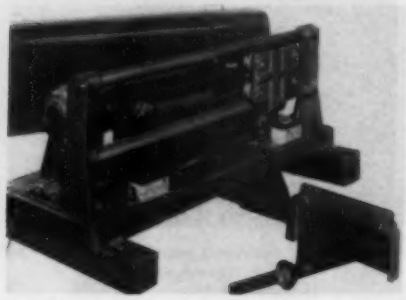
At this operation, a field preliminary screening plant is used and a considerable portion of the excess fines are wasted back into the pit. As the deposit is relatively shallow and the hourly tonnage relatively high, portability of all equipment is stressed.

Portable oil tank

NEW Machinery

Automatic Sampler

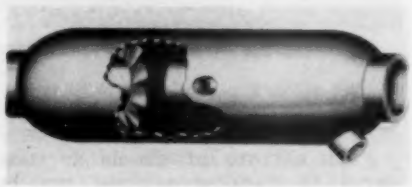
DENVER EQUIPMENT CO., 1400 17th St., Denver 2, Colo., has acquired exclusive manufacturing and sales rights to the automatic sampler formerly known as the GECO sampler. It was produced by the Heginbotham Equipment Co., Salt Lake City, Utah. The unit, known as the Denver automatic sampler, had a sliding contact which has been replaced by carriage assembly on ball bearing rollers. The cutter, with standard travel of either 16 or 21 in., is actuated by means of a positive chain and sprocket drive. The driving unit is a gearmotor operating at intermittent intervals. Cutter travel speed is fixed at 7½ in. per second, but a manually-operated switch can be used to operate the cutter at other than its set time cycle.



Sampler with standard travel of 16 or 21 in.

Vapor Line Purifier

V. D. ANDERSON CO., 1935 W. 96th St., Cleveland 2, Ohio, has announced the development of a line-type purifier, Type LC Hi-eF, for smaller pipelines from ½ to 2 in. The company reports that each unit is warranted to remove more than 99 percent of the entrainment. The purifier is installed like a valve or steam trap, and is compact in size; the 2-in. purifier is only 5 in. in dia. and 17 in. long. Designed for steam applications up to 400 p.s.i.g. and 500 deg. F., the body is forged steel with stainless centrifugal elements.



Details of purifier

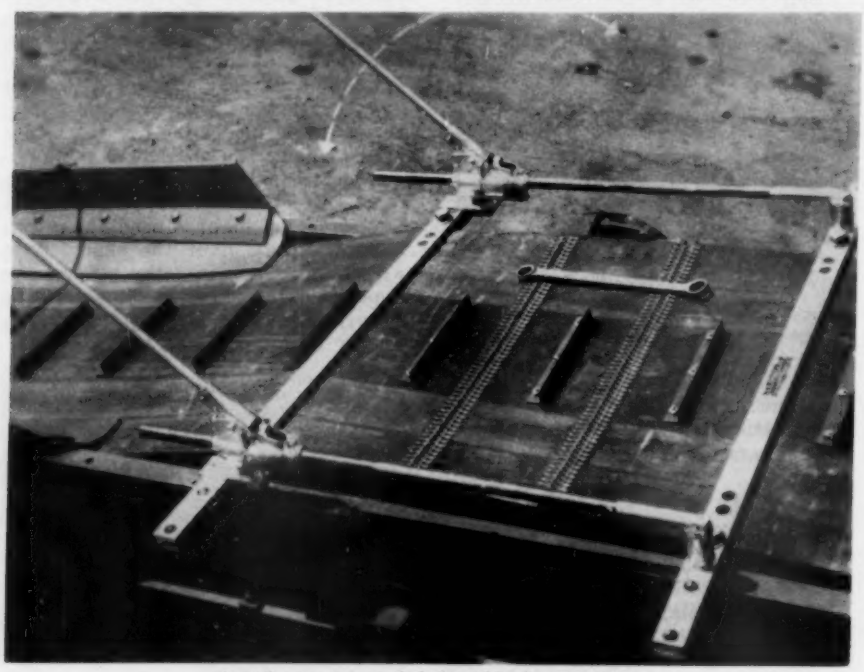
Single reduction motor of 25 hp. rating

Variable Speed Motors

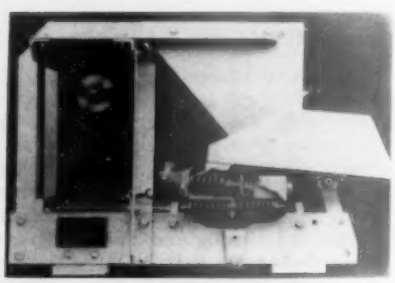
STERLING ELECTRIC MOTORS, INC., 5401 Anaheim—Telegraph Rd., Los Angeles 22, Calif., has announced the addition of Type KFEA variable speed units with single reduction gears in ratings of 20 to 25 hp. These units are manufactured in speeds of 728 r.p.m. and lower with infinite speed adjustment within the ranges of 2:1, 3:1, or 4:1. Illustrated is one of the 25-hp. units with a speed variation of 4:1 and output speeds of 324 r.p.m. down to 81 r.p.m.

Belt Stretcher

G. N. CRAWFORD EQUIPMENT CO., 6714 Kelly St., Pittsburgh 8, Penn., is the national distributor for the Farnco "All Aluminum" Conveyor Co.'s Far-Pul belt stretcher. The ends of the device, which are firmly gripped between two bolted plates, are connected with two jacks on an adjustable bar, one on each side of the belt. Each jack controls its side of the belt, permitting, it is said, an accurate mesh of the stretched belt.



Stretcher in sizes to fit belt widths from 8-36 in.



Details of vibrating feeder

Vibrating Feeder

HENRY SIMON LTD., Cheadle Heath, Stockport, England, has in production a vibratory feeder, the Velofeeder, which is said to have low power consumption in handling many kinds of materials—damp or dry, smooth or lumpy. The feed tray of the machine, which can be 12, 18 or 24 in. wide, has a working stroke variable over a range from virtually motionless to a maximum of nearly ¼ in. at 1850 vibrations per min. The motion of the tray is perpetuated by a ⅛-hp. motor driving a small rotating out-of-balance weight assembly that gives impulses to the anvil on which it is mounted, the anvil being so arranged that it can oscillate between springs.

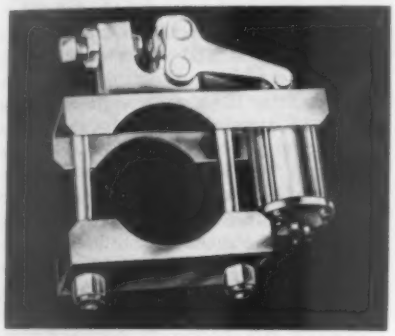
Electric Excavator

BUCYRUS-ERIE Co., South Milwaukee, Wis., has announced its 6-cu. yd. Ward-Leonard electric excavator, known as the Model 150-B. The shovel has a lower boom section rigidly connected to the A-frame, which is an integral part of the machine. The shovel is fully convertible to a dragline, with the drag and hoist functions operated by independent electric motors. Seals are provided to eliminate entrance of abrasive material into the bearings. Rapid change is said to be provided between hoist and propel to facilitate quick move-ups and prompt travel away from dangerous faces if required.

Excavator with 6-cu. yd. capacity

Mounting Clamp

VIBER Co., 726 S. Flower, Burbank, Calif., has designed an air-operated mounting clamp to speed up attachment of external vibrators to load.



Air-operated mounting clamp

The company reports that no lengthy installation is necessary as air pressure applied first to the clamp causes specially designed jaws to grip securely onto a suitable steel member, such as an exposed angle. This is said to require only a few seconds and air can be applied to the vibrator immediately for whatever period vibration is necessary.

Industrial Engines

FORD MOTOR Co., Tractor and Industrial Engine Div., Dearborn, Mich., has designed three new heavy-duty industrial engines, equipped with overhead valves, bringing to six the number of Ford engines built for industrial applications. Also available, it was announced, is a torque converter, which is said to combine the advantages of a fluid coupling plus torque multiplication.

The engines are the 317, 279 and 215; the numbers identifying each engine correspond to its displacement in cu. in. The 317 is rated at 140 brake hp. at 2800 r.p.m., and is a V-8 with 3.8-in. bore and 3.5-in. stroke. The 279 is rated at 125 b.hp. at 2800 r.p.m., is also a V-8 and has a 3.56-in. bore and 3.5-in. stroke. The 215 is a 6-cyl. engine rated at 93 b.hp. at 2800 r.p.m., has a 3.56-in. bore and 3.6-in. stroke.

Extends Truck Line

INTERNATIONAL HARVESTER Co., 180 N. Michigan Ave., Chicago 1, Ill., has introduced factory-built, liquefied-petroleum-gas-powered engines as optional equipment on all International trucks which are equipped with the company's Super Red Diamond en-

Propane-butane fueled truck

gines. The standard gasoline tanks have been replaced, on the LP-gas models, by heavy-steel, dual 62-gal. liquid measure tanks, which are filled to approximately 90 percent capacity, allowing space above the liquid for expansion. Safety features include vertical venting pipes to permit discharge of reliefed gas into the atmosphere, seal caps and automatic excess flow shut-off valves on fuel tanks and in the lines; electric shut-off valves; and extreme high-pressure lines and fittings.

Screen Heating Unit

ALLIS-CHALMERS MANUFACTURING Co., 975 S. 70th St., Milwaukee, Wis., has announced its Thermo-Deck heating unit, designed to eliminate blinding when screening moist, fine materials. The heating unit uses the screen's standard steel clamping bars as electrical conductors, and current is carried by pressure contact from bus bars through the clamping bars to the screen cloth to provide uniform heat distribution over the entire screen surface. Small air-cooled. dry-type transformers are furnished with the heating unit.

Speed Reducer Release

DODGE MANUFACTURING CORP., Mishawaka, Ind., has developed an overload release for its torque-arm speed reducer, which is said to provide immediate and positive protection for driven machines, motors and the speed reducer itself. The new product has been named the Dodge Tri-Matic overload release and, it is said, operates both mechanically and electrically to (1) loosen the belts, (2) cut off the current, and (3) activate a warning bell, siren or light. This new unit replaces the standard torque arm that is regularly furnished with the speed reducer—the two are interchangeable.

Overload release for torque-arm speed reducer

Crushed Stone Industry to Operate at Capacity in 1952

Machinery exposition, business outlook, drilling and blasting, safety, pavement design and construction, government regulations highlight national meeting

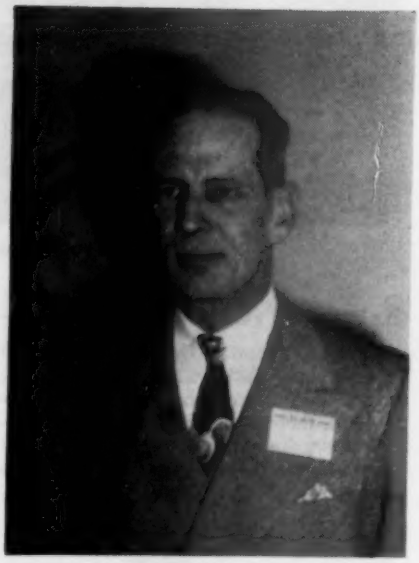
ATTENDANCE OF APPROXIMATELY 1400 at the 35th annual convention of the National Crushed Stone Association, held February 18-20 in Chicago, Ill., was an all-time record. This convention was strictly for commercial crushed stone producers, the Agricultural Limestone Institute having been dissolved December 31, 1951, then merged with N.A.L.A., in formation of the National Agricultural Limestone Institute.

The convention followed by a week the combined meetings of the National Sand and Gravel Association and the National Ready Mixed Concrete Association, according to established custom for the even years, when the biennial exposition of equipment is held. This year's exposition was the largest and most comprehensive show in history, both in numbers of exhibitors and in display space, which was a special attraction for operating men. Two full convention sessions were set aside exclusively for inspection of the machinery and operating supplies.

The 1953 convention will be held at the New Yorker hotel, New York, N.Y., the week of February 1, without exposition. In 1954, the convention and exposition will again be held at the Conrad Hilton hotel in Chicago, either the week immediately before or after the meetings of the National Sand and Gravel Association and the National Ready Mixed Concrete Association.

Convention Program

The program provided, in addition to two sessions set aside for equipment inspection, an entire session for operating men and equipment manufacturers with emphasis on drilling and blasting and on quarry safety. Among other subjects covered were reports on business conditions, reports of the engineering director, field engineer and administrative director, pavement design and construction, wage and salary controls, percentage depletion, safety, availability of repair parts and capital equipment, characteristics of aggregates, price control and the outlook ahead.



Horace C. Krause, president of Columbia Quarry Co., St. Louis, Mo., was elected president of N.C.S.A.

Officers and members of the executive committee were elected at a meeting of the board of directors preceding the convention. In this meeting, which had almost 100 percent attendance, there was considerable discussion of finances and percentage depletion. On the latter subject the emphasis was on the course of action to be taken by the industry so that a regulation will be written based on the facts and which will be favorable. Consensus was that each producer should have filed his March 15 tax return according to the allowance to which he thinks he is entitled. It also was the opinion that necessary facts about the industry be made available as a guide to the regulation that will be written by the Bureau of Internal Revenue.

P. E. Heim, past chairman of A.L.I., reported on the dissolution of the A.L.I. which incidentally has resulted in financial benefit to the N.C.S.A. N.C.S.A.'s finances are in the best shape in history to carry on the work for its members. This resulted from the increase in the rate of dues voted in 1951, return to N.C.S.A. by the A.L.I. of the 20 percent allocation of dues received from the Manufacturers Division and return of $5000 from A.L.I., originally appropriated to help A.L.I. get started. In his report to the board of directors, administrative director J. R. Boyd reported a net gain of five new members in 1951 and a gain of ten associate members. The totals at the end of the year were 132 active members and 104 associate members.

Manufacturers Division held a board of directors meeting and also its annual luncheon business meeting. A dinner meeting was scheduled for the accident prevention committee and, in addition, there were two industry luncheons featured by nationally-renowned speakers. Social events included the traditional cocktail party and buffet dinner, and the annual reception and banquet.

Presiding Officers

J. Reid Callanan, president of N.C.S.A., presided over the opening session, which summarized business conditions as reported in advance by the regional vice-presidents, and heard the annual reports of the Washington staff. The session opened with a showing of the sound motion picture "Let's Get Out of the Muddle," a General Motors Corp. presentation which dramatized the serious condition of the nation's highways and called for action to solve the problem. This film was packed with facts and figures and is available for showing to civic, fraternal, government, church or other interested groups.

Other session chairmen were Dexter Bullard, New York Trap Rock Corp., New York, N.Y., over the special session for operating men and equipment manufacturers; W.R. Sanborn, Lehigh Stone Co., Kankakee, Ill.; and H. E. Rainer, Federal Crushed Stone Corp., Buffalo, N.Y. H. A. Clark, Consumers Co., Chicago, Ill., presided for the greeting luncheon at which Dr. William H. Alexander, pastor, First Christian Church, Oklahoma City, Okla., gave an excellent speech which he entitled "Faith and Freedom." Sam-

uel Grafton, news analyst, spoke on the subject "Who Owns the Future" at the annual general luncheon for which W. S. Weston, Jr., Weston and Brooker Co., Columbia, S.C., presided.

Officers

Horace C. Krause, president of Columbia Quarry Co., St. Louis, Mo., was elected president of N.C.S.A., succeeding J. Reid Callanan, Callanan Road Improvement Co. Elected to the executive committee, in addition to Mr. Krause who is chairman, were J. Reid Callanan; T. C. Cooke, Lynn Sand and Stone Co., Swampscott, Mass.; Wilson P. Foss III, New York Trap Rock Corp., New York, N.Y.; S. P. Moore, Concrete Materials & Construction Co., Cedar Rapids, Iowa; Russell Rarey, Marble Cliff Quarries Co., Columbus, Ohio; W. S. Weston, Jr., Weston and Brooker Co., Columbia, S.C.; and W. F. Wise, Southwest Stone Co., Dallas, Texas. In addition, Irwin F. Deister, Deister Machine Co., Fort Wayne, Ind., newly elected chairman of the Manufacturers Division, is automatically a member of the N.C.S.A. executive committee. Otho M. Graves was elected an honorary member of the executive committee in tribute to his many years of active effort in the interests of the association.

James Savage, Buffalo Crushed Stone Corp., Buffalo, N.Y., was re-elected treasurer. Administrative director and secretary J. R. Boyd, engineering director A. T. Goldbeck and field engineer J. E. Gray were also re-elected. The board of directors had been previously elected as were the regional vice-presidents who are L. J. Boxley (Southeastern), A. J. Cayia (Northern), E. Eikel (Southwestern), Wilson P. Foss III (Eastern), A. W. McThenia (Central), S. P. Moore (Midwestern), Warren C. Rowe (New England) and Anna R. Wilson (Western). Representing the Manufacturers Division on the N.C.S.A. board are Irwin F. Deister, Wayne W. King and J. Craig McLanahan.

Business Conditions

Retiring president J. Reid Callanan, in calling the convention to order, said that the advance registration which indicated a record-breaking attendance was strong evidence of the strength of the association and its importance. He outlined the program and urged that full advantage be taken of the time provided for inspection of the exposition.

He then summarized reports by the regional vice-presidents on business conditions during 1951 and the outlook for 1952. Each regional vice-president had submitted a report in advance which was prepared from a compilation submitted to him from members in his region.

Business conditions were excellent this past year and, in general, 1952 will be another high volume year for the industry. The forecasts were even more optimistic than might have been expected judging from all that has been read in the general press about deferments of construction, etc. In some areas there is evidence of growing competition from roadside plants. One of the trends that continues is the tendency to specify more of the smaller sizes of crushed stone which necessitates more installation of re-crushing equipment.

In the northern region, volume of sales increased 5 percent in 1951 as compared to 1950 and prices increased by 8 percent. Demand was estimated as 10 percent in excess of capacity. In this area, by far the greatest tonnage is of chemical and metallurgical stone, which represented 80 percent of the total in 1951. Of the balance, 4.5 percent was for highway construction and 15 percent for building construction which left less than one percent for agstone, riprap and other uses.

The same distribution, according to sales, is expected in 1952 and it is expected that volume of sales will increase, productive capacity having been increased by 10 percent in 1951. Producers anticipate a good market for the next several years. While equipment needs have been met thus far, deliveries have been slow.

In the eastern area, all producers who replied reported increased volume in 1951 over 1950 with two exceptions. The reduction in one case was only 3.3 percent and, in the second case, volume was the same. Increases in volume ranged between 5 and 30 percent and most plants operated at maximum capacity. Price levels were unchanged for half the reporting companies and were increased to as high as 12 percent for the others.

Largest volume was for highway construction, which ranged from 41 to 85 percent. Building construction consumed the next largest fraction and railroad ballast was third. Distribution by sales is expected to be about the same in 1952. Most producers are optimistic for 1952 while two anticipate decreased volume. One company increased capacity by 2000 t.p.d. and several concerns have increased their production of finer sizes of stone. The outlook for 1952 is considered good and prices are expected to remain stable.

In the New England region, there were volume increases between 5 and 9 percent due to increased construction of highways, airports and defense construction. More activity in that direction is expected in 1952. Capacity operations were required and many companies had to increase capacity to meet demands. Approximately 75 percent of the tonnage was for highways and airports, and prices held firm at 1950 levels. Railroads

The convention program was so arranged that producers had plenty of time to visit the numerous displays of equipment. The machinery exposition was one of the biggest and most complete exhibitions held by the Manufacturers Division

purchased more ballast than normal and there was a slight upturn in volume of building construction in 1951, reflected in increased use of ready-mixed concrete. It is expected that 1952 volume will equal that for 1951 except in cases where highway construction may be cut.

Producers in the central region generally experienced increased volume of business in 1951 when compared with 1950, the increases ranging up to 30 percent. Prices generally held at the same level. In this area, 9.5 percent of the tonnage was agricultural limestone.

Volume of sales in 1952 is expected to equal the 1951 figure. The tendency is for increases in agstone and finer sizes of commercial stone. Increases in railroad transportation costs are expected to result in more roadside plant competition.

Volume of business increased 20 percent in the midwest region and prices were 8 percent higher, comparing 1951 with 1950. Distribution to highway construction was up considerably and sales for building construction and metallurgical use were also higher. Agricultural limestone sales for those reporting were decreased considerably. It is anticipated that changes in the design of roads requiring more use of base materials will be reflected in increased volume. It was reported that agricultural limestone producers are entering the commercial crushed stone business. The outlook for 1952 is optimistic due to increased activity in building roads in Iowa, Kansas and Missouri.

Volume of sales in 1951 increased approximately 10 percent in the southwestern region and prices were increased about 4 percent on the average. Plant capacity on a one-shift basis was required, generally, and demands in new defense areas exceeded the supply. Plants, as a result, are being enlarged and some new ones are being built. As to distribution, 48 percent was to highways, 20 percent railroad ballast and 23 percent for building construction.

While building construction is expected to drop off, and some highway building, prospects are that volume of sales will be increased in 1952. Seven new plants have gone into production.

In the southwestern region, volume of sales increased 25 percent in 1951 and average prices went up 5 percent. Distribution of sales was 45 percent for highways, 18 percent railroad ballast, 15 percent chemical-grade stone, 8 percent building construction, 3 percent riprap and 2 percent agstone. The same relative distribution is expected in 1952 and it is expected that capacity will be increased 20 percent.

There was no report for the western region but one was read for Canada, where volume of sales increased 15 percent and prices went up 5 percent. All plants operated at capacity. Distribution was 35 percent chemical and metallurgical, 33 percent building construction, 20 percent highways, 10 percent railroad ballast and 2 percent agstone. It is expected that volume will decrease by 10 percent in 1952 due to curtailments in defense work. There were slight increases in recrushing capacity in 1951.

As a result of a 12 percent increase in freight rates in 1951 and a requested further increase of 15 percent, highway contractors are producing considerable crushed stone for their own use. Due to a high farm income and the outlook for much country road construction, 1952 is expected to be a favorable year.

Administrative Director's Report

J. R. Boyd, administrative director, made his annual report brief, having covered most of the activities of his office by administrative letters sent to the membership throughout the year. He commented on the subjects of the convention program and the strong financial position of the association. The N.C.S.A. is a service organization, he said, and as such is more important than ever during these times of mobilization. He pledged himself to help producers in getting the answers to their particular problems.

ENGINEERING DIRECTOR'S REPORT

ENGINEERING DIRECTOR A. T. Goldbeck devoted his annual report to a discussion of some of the technical problems concerned with the uses of crushed stone rather than to a review of activities as such. These problems as discussed concern the crushed stone itself, its combination with other materials and also the design of pavements.

He first considered densely graded aggregate construction which is gaining in favor over the old waterbound macadam base course. This class of construction places great emphasis on gradation of the stone as the means of attaining a dense, uniformly graded, compact layer which will remain stable and not become too unstable when wet. For best results, the stone must have sufficient fine material of screenings size to fill the voids; ordinary crusher-run stone is not satisfactory because it is lacking in enough of these fines.

J. E. Gray, field engineer of the association, is making a special study to determine the best method of constructing the densely graded aggregate type of base course and, according to Mr. Goldbeck, this study will soon result in published information on necessary gradation limitations and on construction methods. He cautioned producers that only properly graded stone be supplied for these base courses to guard against failures.

The New Jersey turnpike was mentioned as a notable example of penetration macadam bases, the asphaltic penetration type having been chosen because it was considered the more economical type. The necessity for adequate use of choke stone and thor-

Left: A chuckle is enjoyed by (l. to r.) N. C. Rockwood, ROCK PRODUCTS; Paul M. Nauman, Dubuque Stone Products Co., Dubuque, Iowa; A. L. Worthen, New Haven Trap Rock Co., New Haven, Conn.; and John Prince, Jr., Kansas City Crushed Stone, Kansas City, Mo. Center: The registration booth was a busy place. In the right foreground are, l. to r., Luther F. Miller, and Andrew Komonchak, both of New York Trap Rock Corp., New York, N.Y., and G. R. Trumbull, Torrington Co. Right: Bruce Woolpert, Granite Rock Co., Watsonville, Calif., left, visits with Otho M. Graves, General Crushed Stone Co., Easton, Penn.

Left: Some mathematical figuring is necessary in guessing the number of blasting caps in a jar at one of the displays by, l. to r., Bruce Woolpert, Granite Rock Co., Watsonville, Calif.; A. T. Goldbeck, engineering director, N.C.S.A.; James M. Rice, N.C.S.A.; and Harry H. Brandon, Melvin Stone Co., Melvin, Ohio. Center: Luncheon speaker Dr. William H. Alexander, Oklahoma City, Okla., gave a forceful and inspirational address. Left: Touring the machinery exposition are, l. to r., Wood W. Weaver, Weaver Construction Co., Iowa Falls, Iowa; Dean Curphy, W. C. Wheeler, Marvin Nelson, and C. B. Moore, all with Concrete Materials & Construction Co., Cedar Rapids, Iowa

ough compaction of penetration macadam was emphasized. Subsequent excessive compaction of such courses under heavy wheel loads is to be avoided or objectionable wheel depressions would result.

Mr. Goldbeck commented on asphaltic concrete pavements which, while backed by a long record of successful use, frequently present troubles. In such roads, proper gradation of the aggregates is of utmost importance, he emphasized, in yielding stability. It is important that use be made of rough, angular aggregate, not too much asphalt and not too soft an asphalt. Asphaltic surfaces often are slippery because they have become so dense under compaction by traffic that the asphalt has been forced to the surface during hot weather. A not too dense, stony textured surface with asphalt on the lean rather than on the rich side is preferred. Mr. Goldbeck offered to discuss optimum gradation with anyone interested in the subject.

The army requires a much denser surfacing for its runways than most states do in their highways which, he said, necessitates having more fine particles in the aggregate.

Concrete Pavements

In his comments on concrete pavements, Mr. Goldbeck said that the main problems center around the adequate waterproofing of joints and shoulders. If not waterproofed, water reaches the subgrade, softens it and then heavy wheel loads cause mud-pumping. In his opinion, the use of screenings and densely graded stone makes an ideal subgrade, to counteract pumping and give proper support to the pavement. To emphasize the remarkable load-supporting capacity of screenings, he mentioned the successful experience on the New Jersey turnpike.

Use of dense-graded stone or screenings as a subbase under concrete pavements, he said, takes on added importance due to the short supply of concrete reinforcement and dowels in supporting the pavement against faulting or vertical joint movement.

Expansion of some pavements is due to several causes. Use of some porous aggregates, he said, while they may otherwise be sound, make for excessive concrete expansion as evidenced by D-cracking and blowups. Water was pointed to as at the root of this trouble as it is with most concrete durability problems, due to expansion of water in pores of small size. He mentioned that water has a thermal coefficient of expansion six or seven times that of stone. This necessitates doing whatever can be done to prevent the stone from becoming completely filled with water. Preliminary drying of stone together with use of an effective granular base to prevent capillary water from reaching the pavement from the subgrade, in his opinion, represents the answers to the problem.

Mr. Goldbeck touched upon chemical reactivity, which involves both the cement and aggregates, as another cause of expansion. Use of low alkali cements, with certain aggregates containing opal or other suspicious minerals, is one suggested solution. Another cure is to replace some 30 to 35 percent of the portland cement with a pozzolanic material which would require air entrainment to resist freezing.

In touching upon research by the cement industry, Mr. Goldbeck said that the addition of salts of lithium, experimentally, has been found beneficial. Water being the main culprit, it was suggested that bridge abutments can and should be waterproofed and that excess water in the soil can be drained away.

The main point for aggregate producers to recognize, said Mr. Goldbeck, is that some aggregates do contain minerals which react unfavorably with alkalies in cement, but he believes that the cement manufacturer should work toward improvement of the cement.

It would be of help, he further commented, if the engineer would give emphasis to proper design of a structure such as the use of waterproofing and the requirement of granular, noncapillary layers next to the concrete.

On the subject of concrete proportioning he pointed out that different cements and sands and coarse aggregates will give somewhat different water-cement ratio strength relationships. He referred to N.C.S.A. Bulletin No. 11 published in 1942 and its revision, in 1949, to account for air entrainment, on the subject of concrete proportioning and urged that members encourage its wide use.

In commenting on concrete fire tests reported recently by the National Bureau of Standards, he warned that those interested in the relative behavior of different aggregates in concrete subjected to intense heat, study the tests and understand the reasons for seemingly contradictory results obtained. These results are apparently somewhat in conflict with an earlier report on the properties of siliceous gravel and quartzite.

In cases where an excessive amount of chert in limestone may cause trouble in concrete, it was suggested the heavy-media separation process might be tried to eliminate undesirable portions. In conclusion he suggested that the engineering staff might be helpful to those members who are having difficulty with their stone due to variations in soundness and other physical properties of the stone as taken from the various ledges in a quarry.

Field Engineer's Report

Joseph E. Gray, field engineer, read a "Report on the Construction of Macadam Base Courses of the Non-Bituminous Type" based on field inspection of various classes of these courses and their construction. His

presentation reviewed macadam base construction, and causes for complaints, and suggested remedies in their relation to the production of crushed stone. The flexible pavement is a tremendous potential market for crushed stone, and Mr. Gray's talk, illustrated by excellent colored photographs of actual construction practices, showed how such good base courses should be built to insure success of the flexible pavement.

His paper started with a historical reference to the early use of macadam roads and led up to modern practices. Macadam construction as used today for base courses is considered an excellent foundation for bituminous surfaces. Mr. Gray has visited and studied a number of jobs under construction to determine how objections to waterbound macadam bases are being overcome in some areas and why such bases have been successful in other areas. His paper went into considerable detail on actual construction practices which are required for best performance and how placing of drainable subbases between the subgrade and macadam course overcomes many of the water difficulties and aids in load distribution.

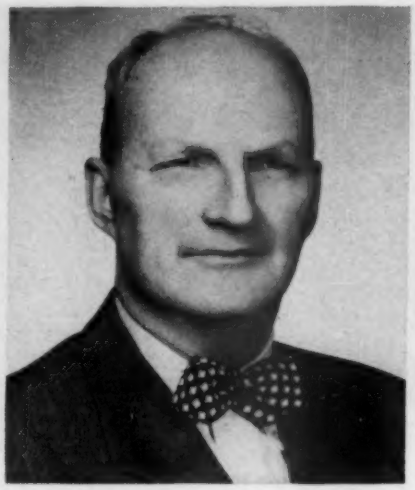
What constitutes a drainable material has not been definitely established but, he said, a material with not more than 5 percent elutriable material appears to offer a suitable aggregate.

Methods of placing the stone course were then described in detail, including spreading and rolling practices and the filling of voids with screenings. Rolling is done not only to compact the stone but so as to create aggregate interlock through the angularity of the pieces. Caution must be used not to over-roll where the stone is relatively soft and friable; otherwise the key would be broken by crushing the corners of the stone. High density is necessary for proper functioning of a base course, necessitating complete filling of the voids in the rolled stone.

It was brought out that the use of an inverted choke consisting of a 1-in. layer of screenings placed on the base prior to spreading the stone is effective in preventing intrusion of the subgrade, in securing density and in reducing the amount of work required to fill the voids.

Whereas it was standard practice to use one size of stone 25 years ago, practice today is to require a graded stone for the purpose. An example cited was a recent job which required a maximum size of 1½ in. with a lower limit of 30 percent passing the 1-in. sieve. The large single size of stone, when compacted, has open voids readily filled with screenings whereas the graded stone with void spaces of small area is far more difficult to fill.

Whereas the Simplified Practice Recommendations sizes 1 and 2 are believed to offer the most desirable



Retiring N.C.S.A. president J. Reid Callanan, Callanan Road Improvement Co., South Bethlehem, N.Y.

grading specifications for waterbound macadam, one state was mentioned as still retaining a specification for the large, closely sized stone. In this state, 100 percent must pass a 4-in. sieve, 90-100 percent the 3½-in. sieve, 35-70 percent minus the 3-in. sieve and 0-15 percent may be minus 2½ in.

Waterbound macadam construction offers some advantages and disadvantages to the crushed stone producer, depending upon the nature of the business. Quarries that supply metropolitan areas as well as rural markets like it because it rounds out their markets for all sizes. Intermediate sizes are used for concrete and black-top purposes, and the oversize and screenings are sold for macadam construction.

The so-called "rolled rock base" macadam construction which consists of compacting into a solid mass a graded stone including the dust of fracture is predominately used west of the Mississippi river but, Mr. Gray said, there seems to be a trend toward extending the practice in various parts of the country.

Preparation of the subbase and construction of the base course were described in detail. In this type of construction it has been demonstrated that for best results the stone must be of a continuous grading held within reasonable limits. Rolled rock base work lends itself well to portable plant operations because all of the aggregate produced is consumed by the one job. Producers with permanent plants furnishing aggregate for cement concrete and bituminous concrete do not desire to produce a base aggregate that requires use of all the higher-priced sizes. A case was mentioned where a stationary plant producer found it more economical to set up a portable plant near a road job five miles distant from his stationary plant rather than interfere with the normal production schedule, in filling a contract for base aggregate. Other producers have solved the problem by producing a special crusher-run aggregate from top strata of their deposits.

Sales Mobilization

"Mobilizing Your Sales Forces for Today's Problems" was the title of a challenging talk by Robert A. Whitney, president, National Sales Executives, New York, N.Y. Mr. Whitney drove home the point that the responsibilities of the salesman are more important during a mobilization economy than in normal times, and that stress should now be on building a sales organization to guard against a serious depression that otherwise will follow cut-backs in defense spending.

He gave some facts and figures to show the enormous potentials for sales. One point was that 41,000 prospects are coming into the market every day, which demands a constant selling job. Of our total population, 27,000,000 families do not have sinks, 40,000,000 have no bathtubs and 25,000,000 do not have vacuum cleaners, which figures were given to illustrate the scope of the selling job to be done. Our national productive capacity will be increased by 35 percent after defense spending is completed, which means that 35 percent more products must be sold.

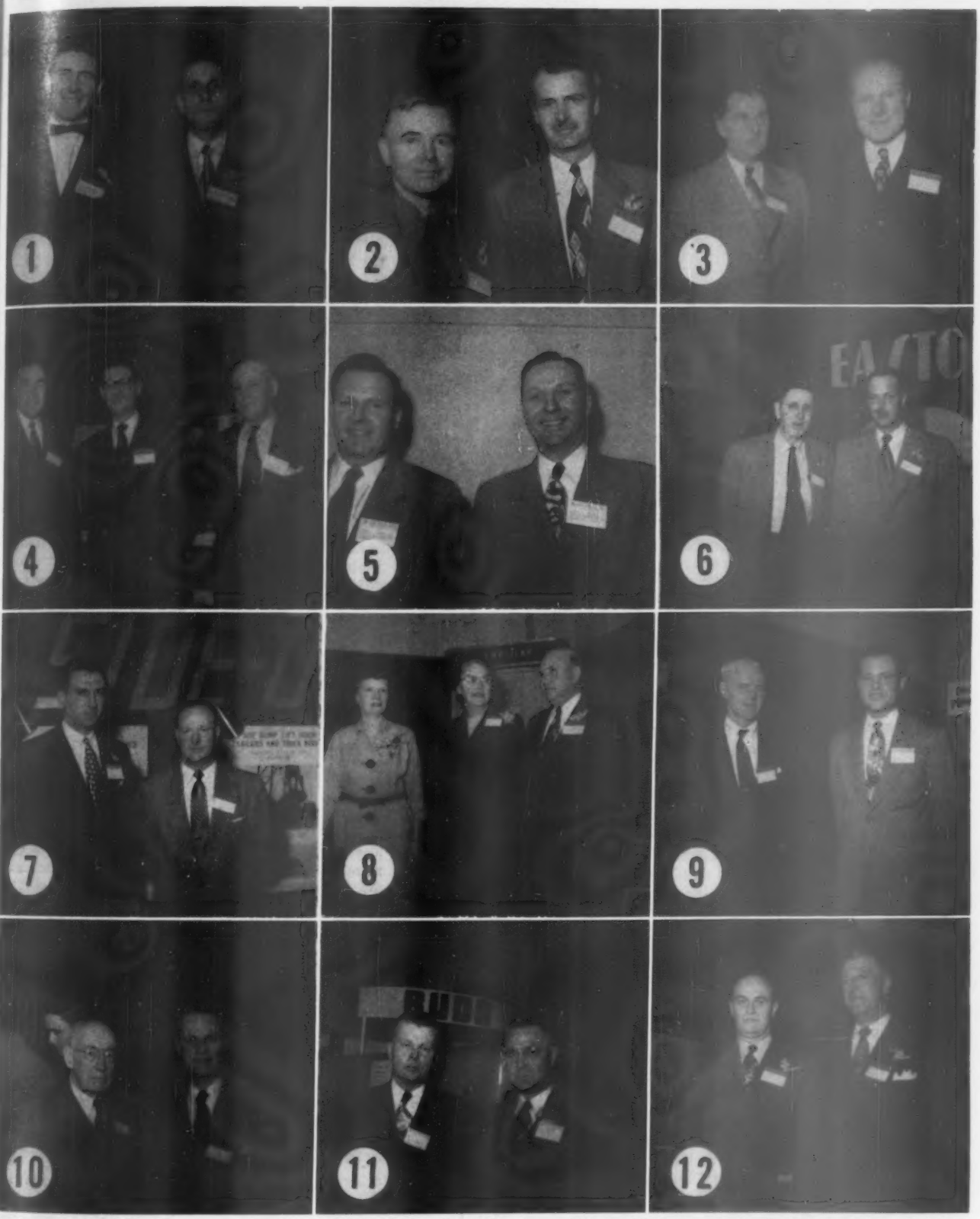
After defense expenditures are cut off, Mr. Whitney said that $27 billion worth of goods must be sold annually or the alternative is depression and that the challenge is to build sales staffs and conduct necessary research to take up that slack. The need is for creative selling and it takes two or three years to build the necessary sales force to do it. Every salesman in the United States keeps 33 men at work according to his figures.

In conclusion, he stressed the need for selling our system of free enterprise along with products and that that job be done on school children too in order that these potential customers will have the right slant.

At the Tuesday afternoon session committee reports were presented as follows: T. C. Cooke, auditing report; W. S. Weston, Jr., resolutions; H. C. Krause, percentage depletion report; M. Rowe for the group insurance committee; and Otho M. Graves reported for G. A. Austin on membership. Mr. Graves said that 70 percent of the crushed stone in the United States was produced by members of the National Crushed Stone Association.

New Jersey Turnpike

Commander Charles M. Noble, chief engineer, New Jersey Turnpike Authority, Trenton, N.J., described briefly the 118-mile long turnpike, opened to the public on January 15 of this year. He said that it was designed for 36,000-lb. axle loads. He described the subgrade as a grade "B" zone.



Producers were able to pick up numerous operating tips and ideas by touring the machinery exhibits. 1—W. R. Smallwood, General Crushed Stone Co., Syracuse, N.Y., left, and E. D. Barton, General Crushed Stone Co., Watertown, N.Y. 2—James H. Grove, Jr., M. J. Grove Co., Inc., Frederick, Md., left, and John V. Kelly, M. J. Grove Lime Co., Middletown, Va. 3—Henry Homont, left, and Lea P. Warner, Jr., Warner Co., Philadelphia, Penn. 4—Canada and United States are represented by, l. to r., J. E. Gray, N.C.S.A.; C. B. Moore, Concrete Materials & Construction Co., Cedar Rapids, Iowa; and Frank Rousell, Canada Crushed & Cut Stone, Ltd., Hagersville, Ont. 5—Frank L. Anderson, left, and Lloyd E. Quarve, of Quarve & Anderson Co., Rochester, Minn. 6—Walter R. Thacker, left, and Howard D. Perry, of Southwest Stone Co., Dallas, Texas. 7—Harry J. Dempsey, Jr., Easton Car & Construction Co., left, chats with E. A. Heise, Columbia Quarry Co., St. Louis, Mo. 8—Florence Kahl, Caterpillar Tractor Co., left, has just pinned flowers on Mr. and Mrs. James R. Thompson, Blanton Stone Co., Frankfort, Ky. 9—Dexter Bullard, New York Trap Rock Corp., New York, N.Y., left, and W. Irwin Gill, Gill Rock Drill Co. 10—James Savage, Buffalo Crushed Stone Corp., Buffalo, N.Y., left, and M. E. McLean, East St. Louis Stone Co., E. St. Louis, Ill. 11—Dale Solse, Basic Refractories, Inc., Maple Grove, Ohio, left, and M. E. Hoffman, Loomis Machine Co. 12—William B. Ryan, left, and Robert J. Hummel, of Consumers Co., Chicago, Ill.

since the base section was 12 in. thick and mostly sand and gravel with not over 10 percent minus 200 mesh. On top of this were 16 in. of grade "A" with not over 6 percent minus 200-mesh material. It was put down in 6-in. courses and packed with 25,000-lb. pack loads. A 4-ft. ditch was the minimum. The road, he said, was financed by a $255,000,000 bond issue and interest required a revenue of $24,000 per day.

During February, 1952, the revenue was $29,000 per day. On a Sunday during that month 71,200 automobiles used the turnpike but to date truck usage has not come up to expectations. He described the top courses as being an all crushed stone bituminous hot mix, with a 2½-in. top course and a 3-in. lower course. (See February, 1952, issue of ROCK PRODUCTS, page 113, for more details of this aggregate and its use in the New Jersey turnpike.) Colored slides were used to illustrate some of the construction features of the roadway.

Wage Controls

William F. Howe, general counsel, National Crushed Stone Association, gave a talk on the subject of "Wage and Salary Controls." Much of the material that the national association mails to its members on the subject stems from Mr. Howe. In his talk he reviewed the general subject, which is complicated and ever-changing.

Percentage Depletion

James W. Haley, vice-president, Jewell Ridge Coal Corp., Washington, D.C., spoke on the subject, "Practical Application of a Percentage Depletion Allowance to Crushed Stone." Mr. Haley gave a history of the percentage depletion laws and pointed out that President Truman has called upon Congress to close ". . . depletion loopholes." He cautioned that Congress could repeal the depletion act and warned the industry to be on guard for such legislation. He said the coal industry had a 5 percent depletion clause which was raised to a flat 10 percent in 1951. He said he was well aware that, in the crushed stone industry, there are several rates and he suggested that the members rely upon the statutes themselves, the official explanations thereof, and the advice of their own lawyers. In 1948 the sand and gravel and crushed stone industries produced some 457,000,000 tons of material and were allowed less than $2,000,000 as an allowance for tax purposes, said Mr. Haley. Mimeographed copies of Mr. Haley's talk were made available to members of the association. Appended to them were copies of the Internal Revenue Code, Ways and Means Committee reports, Senate Finance Committee reports and other factual data, all of which could help the producer with his tax problem.

General Luncheon

The general luncheon, presided over by W. S. Weston, Jr., had as its main speaker Samuel Grafton, news analyst, New York, N.Y., who spoke on the subject of "Who Owns the Future." Mr. Grafton said that the future is shrinking, meaning that in the past one made plans years in advance, but due to world conditions at present planning is on a day-to-day basis. He dwelt on the Russian menace pointing out that the result has been an economic upheaval in the United States, along with an awareness of our own power.

Outlook for Equipment

Harold A. Montag, director, Mining Requirements Division, Defense Materials Procurement Administration, Washington, D.C., spoke on the subject "The Outlook for MRO and Major Capital Additions for 1952," and gave a brief outline of the background for present priority requirements. He said that as industrial expansion levels off priorities will be operated on more of a time-table schedule. He felt that all crushed stone producers would get their requirements, if justifiable, except in the case of an all-out war. He feels that raw materials sources must take precedence over all other procurement matters and he said that the division is working towards simplification of the procedures, with less paper work required. He also expressed the hope for de-controls. He said that we must have the materials of war to defend the American way of life, for if our system does not survive we can be doomed without a war.

Bruce Campbell, Jr., asked if the military was subject to any controls regarding buying, except by the military itself, and received the answer that anything the military wanted they could get. In reply to a question from the floor the speaker said that no rating was needed on a $5000 purchase if the item or items are in free supply or if the manufacturer has them available.

Aggregate Characteristics

Robert H. Nesbitt, geologist, Office of the Chief of Engineers, Department of the Army, Washington, D.C., gave a talk entitled "The Microscope and Aggregate Behavior." Mr. Nesbitt brought out that durability of concrete is influenced by aggregate behavior and he put less stress on reactivity than physical characteristics with emphasis on pore space. He showed rock sections, viewed under the petrographic microscope, that were convincing enough to show that one would have poor judgment in using such materials to make good concrete, for many of these rock sections showed a weak mineral bond between the particles making up the aggregate. His slides included pictures of several of the dams in the United States that had concrete failure popularly ascribed to reactive aggregates. However, in all the cases illustrated he held that cracking was not due to the aggregates at all but, in most cases, was a surface condition due to laitance working to the surface.

Price Control

"A 'Tailored' Price Order for the Crushed Stone Industry" was the topic of Walter H. Acheson, chief, Building Materials Branch, Office of Price Stabilization, Washington, D.C.

The General Ceiling Price Regulation continues to be the basic control on prices in the industry. Some measure of relief is afforded through the Capehart Amendment (General Overriding Regulations 20 and 21). Mr. Acheson said that the initial steps have been taken to give a tailored regulation to the crushed stone industry, but that much remains to be done.

A meeting of the O.P.S. crushed stone industry advisory committee in November offered recommendations which are now being studied. These included such items as price increases due to transportation cost increases granted by regulatory bodies such as the I.C.C., a tailored regulation for the industry patterned somewhat after the one for agricultural limestone, area adjustments, and individual adjustments. The Building Materials Branch, said Mr. Acheson, feels these are sound recommendations.

A rough draft is now being worked on for a transportation price regulation. It would permit producers, on a delivered price basis, to pass on freight raises granted by regulatory bodies. However, since there is a greater tightening of price control, more justification will have to be presented to O.P.S. and the increases would not be able to exceed the Johnson earning standard. Probably such a regulation, Mr. Acheson said, would come into being before a tailored price regulation.

In discussing tailored regulations, he said they offer administrative advantages for the agency concerned since present regulations cover such a large segment of the building industry. He noted that tailored regulations must offer a fair and equitable price basis, industrywide, but since this may not be always possible for individual cases, there should be a method for adjustments.

He discussed various types of pricing regulations: the formula type (mark up on a cost basis); the "dollars and cents" type (suited to industries with uniform prices); straight freeze (similar to present set-up and inadequate); modified freeze; and periphery plus (similar to CPR 22 and CPR 77). He noted that the techniques used under CPR 77 seem to be a valid way of doing things.

Convention scenes. Left: Mr. and Mrs. Wilbur C. Kleinhans, Callanan Road Improvement Co., South Bethlehem, N.Y. Center: (l. to r.) Charles A. Ferguson, Charles W. Neikirk and Harold B. Biehn, all with Blue Rock Inc., Washington C. H., Ohio. Right: Harry Towns, Eastern Rock Products, Inc., Utica, N.Y., left, visits with B. R. Maloney, E. I. du Pont de Nemours & Co., newly elected vice-chairman of the Manufacturers Division; and John V. Owens, Eastern Rock Products, Inc.

OPERATING SESSION

THE SESSION FOR operating men and equipment manufacturers opened with a color moving picture, presented through the courtesy of the American Meat Institute, called "This Is Life." The picture emphasized the fact that, since in the soil all forms of life receive sustenance, soils must be maintained at a high state of productivity. Insight was given into methods used by meat producers, starting with the farms or ranches and cattle ranges, through shipping by truck and rail, to the packing plants and finally to the consumer.

Drilling

The first talk was presented by E. F. Haberkern, production manager, Columbia Quarry Co., St. Louis, Mo., who reviewed different types of drills used in the quarry industry. These included churn drills, wagon drills, Quarrymasters, rotary hand-held percussion, mounted percussion and diamond drills.

Mr. Haberkern felt that the wagon drill was best adapted to holes 30 ft. or less in depth, and was most efficient when used with a single change of steel and tungsten carbide bits. The type of bit to use, he pointed out, would depend somewhat on the type of stone being drilled. His company used a wagon drill, with holes in the 20-24 ft. range as the maximum that could be drilled without change of gauge.

He emphasized the economy of having the compressor close to the drill since it eliminates extensive labor involved in laying air lines. Later in the discussion he was asked if having a receiver near the drill was as efficient as having the compressor nearby. The speaker replied that the receiver was only a part of the line and that hidden labor charges could be traced to pipe line work. Dexter Bullard told of lightweight pipe with a quick connecting end that is being used successfully in some of his company's operations.

The speaker briefly covered the Quarrymaster drill, saying that it is especially effective in harder rock, for holes from 4-6 in. in diameter, with depths in the 100-ft. range. The Quarrymaster carries a heavy piston-type drill, with hollow drill stems fastened to the piston. Compressed air blows through the stems to remove cuttings which are collected at the surface of the hole in a small cyclonic-type dust collector. The piston hits 200 times per min., with up to a 10-in. stroke. The depth to which a Quarrymaster drill can operate, it was pointed out, has no limits except that of economy. ROCK PRODUCTS, in its July, 1949, issue, page 74, published considerable performance data on this drill.

Mr. Haberkern described briefly the Joy rotary drill of both wet and dry types. The rotary drill is an adaptation of oil well drilling, and a tricone bit is used that rotates with pressure on the rock being drilled. The cone-shaped cutter-head chips out the rock fragments.

In the original models water was employed to remove the cuttings but later air was found to be more efficient, since the use of water required a source, pipe lines and disposal features. In the drill holes, it was pointed out in the discussion, water eddies around the bit retain some of the heavier rock fragments, thereby reducing the drill's effectiveness. Air brings the drill cuttings out of the hole almost the instant they are liberated.

Mr. Haberkern pointed out that the Joy Champion rotary drill is a fast drilling machine but is most effective with medium hard rock, such as limestone. For harder rock, the Quarrymaster type is favored according to him. On a medium hard limestone, by changing from wet to dry technique with a rotary drill, rates were increased to the 25 percent range, with an increase in bit life in about the same proportion. It was also pointed out that tricone bits are not sold to the user but leased, and since they are not supposed to be re-surfaced, when worn too badly for further efficient use, they are to be returned to the leasor.

The speaker said that the drill pattern trend was toward smaller holes with less spacing and less burden and that, with this pattern, over-all quarrying and crushing costs would be lower. The type and size of drill and drill pattern should be matched to suit the operation's desired capacity. He briefly reviewed factors affecting costs.

Diamond drills in some underground work were being used for holes in the 50-85 ft. range, the speaker said, and he reviewed the use of hand-held drills as well as column-mounted drifters in underground work.

The speaker was quite emphatic on the subject of portable compressors, saying that the most efficient method he had found was to mount compressors, of the stationary type, on a suitable chassis to obtain portability. He referred to the portable compressor used in the underground experimental mine at Rifle, Colo., which project is under the direction of the U.S. Bureau of Mines.

In the March, 1952, issue of ROCK PRODUCTS, page 80, a comprehensive article was published on the work at Rifle, which has a direct bearing on

open quarry and underground work. Briefly, the compressor at Rifle is a combined portable compressor and utility station. It carries two Joy compressors of 770 c.f.m. each, along with an air receiver and a 2500-gal. water tank. The equipment is mounted on a 16 rubber-tired trailer. By using such a compressor close to the face, with the heated air having greater volume, increases in efficiency were in the 15 percent range.

Mr. Haberkern told of his company's experience, where two 20-ft. feed drills, along with a compressor, were mounted on a truck. On 2½-in. holes the rate of drilling was 80 ft. per hr., using two drills and two men. He also told of using a jumbo, with which two men drilled at a rate of 60 ft. per hr., and of some drill tests using 3½- and 4-in. drills. The air pressure for the drill tests was maintained at 85, 90 and 95 p.s.i. with the following drill rates obtained: 85 p.s.i.—2.647 ft. per min.; 90 p.s.i.—3.303 ft. per min.; and 95 p.s.i.—3.425 ft. per min. In the discussion that followed it was indicated that at higher pressures more breakage of steel would result.

A member from the floor asked how far below the quarry floor a hole should be drilled to keep the floor level. Mr. Bullard answered that in one of New York Trap Rock's quarries, practice was to drill 7 ft. below the floor line. It was also pointed out that if wagon drills were used to drill holes deeper than 30 ft. more steel breakage might result, along with more stuck drills. He advised drilling 30-ft. holes or less.

Reference was made to the use of auger bits and it was generally felt that this field, after further exploration, would yield something worthwhile. The speaker again referred to Rifle, Colo., where experimental work with augers may lead to something of value for rock producers. Similarly, jet piercing was mentioned as a method of drilling still in the developmental stages. (See November, 1949, issue of ROCK PRODUCTS, page 60, for a description of its use in an Eastern trap rock quarry.)

Quarry Safety

The second speaker was C. A. Gustafson, superintendent, Callanan Road Improvement Co., South Bethlehem, N.Y., who spoke on "Quarry Safety Practices." The acceptance by the crushed stone industry of safety, and the social and economic benefits to be derived from such programs, has been increasing each year. Mr. Gustafson discussed employer-employe relations and outlined some of the steps his company has taken to secure a better safety program at its plants. He described the original safety program, built around the use of posters and slogans, which was a desirable educational step but not good enough. The second stage in the safety program was based on guarding everything that moved and the third stage evolved into education of the employe to a safety program to get still better results.

The Callanan company recently adopted the use of safety spectacles instead of the old fashioned goggles formerly used. The employe pays for examination by the optometrist and the company pays for the glasses. Safety shoes are also required, with the first pair being supplied by the employer. The cost of the second pair is borne by both the employe and the employer, the former paying 25 percent of the cost, and 50 percent of the cost of the third pair of shoes is paid by the employe.

Mr. Gustafson said that hard hats are another requirement. It was also developed that pre-employment examination of a prospective employe includes a chest X-ray costing $10, which fee is paid by the company.

Wilson P. Foss, III, president, New York Trap Rock Corp., urged the membership to strive for safer operations, saying that one method would be to study the causes of minor accidents for prevention methods that later might eliminate more serious accidents. Mr. Bullard said that unions, as a rule, want to cooperate in safety work.

Blasting

The final speaker for the session was T. C. Cooke, president, Lynn Sand & Stone Co., Swampscott, Mass. At the outset of Mr. Cooke's talk he referred to an article which appeared in the January, 1952, issue of ROCK PRODUCTS, p. 148, by Jules E. Jenkins, Vibration Measurement Engineers, Chicago, Ill., saying that his paper, by coincidence, almost paralleled the article by Mr. Jenkins.

The speaker reviewed progress made in the field of millisecond delay blasting saying that, in some instances, seven times as much powder could be used with ⅛ the vibration, and an increase in production of 25 percent. He mentioned a relatively new Primacord delay blasting cap under development, which can be hooked into the Primacord circuit. In a few trial tests the cap gave excellent results, and it is expected to be available to the quarry industry in a short time.

A question from the floor regarding the effect of delays in a series of lines on other lines was answered by F. D. Bickel, E. I. du Pont de Nemours & Co., who said that longer intervals could be used between rows than between individual holes. He advised keeping caps out of the holes if possible.

In answer to a question concerning the amount of powder to use per ton of stone, Mr. Cooke said he based his loading on 3½ tons per lb. of explosives but when the year's figures came in the yield was always more than the figure indicated. He stated that weather did not affect the earth waves but that air waves were influenced; with high humidity and low ceilings he advised that no blasting be done. Dexter Bullard told of using ¼-in. stone screenings for stemming; the Primacord is not covered with stone dust. Primacord air waves have caused some complaint, it was said, possibly due to the "throw" of the dust if the Primacord is covered. Clarence Stetser, New York Trap Rock Corp., told of using a "dry-run" or test run on the company's blasting circuit, as a preliminary to a "wet" run. By means of the test run troubles were located which would have developed fully had the dry-run test not been used.

For wagon drill holes it was pointed out that Primacord could be expensive and that delay shooting was not as safe as instant shots, mainly due to the complicated wiring often required. It was also indicated that fuse and caps on secondary shooting where delay action is used resulted in far less vibration than instant shots.

Floyd J. Buffington spoke briefly of the excellent results obtained by the

In exhibition hall. Left: (l. to r.) Luther F. Miller, New York Trap Rock Corp., New York, N.Y., stops to chat with N. C. Rockwood, ROCK PRODUCTS, and Russell Rarey, Marble Cliff Quarries Co., Columbus, Ohio. Right: O. E. Benson, General Crushed Stone Co., Easton, Penn., poses for a snapshot

use of supersonic methods of testing large castings, in place, for cracks. The system not only reveals such defects but gives the approximate location of the crack. Bruce Campbell made reference to pending legislation of the Johnson Bill, relative to use of trucks for hauling explosives. The bill is evidently designed to prevent interstate transportation of explosives by trucks and Mr. Campbell felt that such legislation would work a hardship on most of the quarry industry.

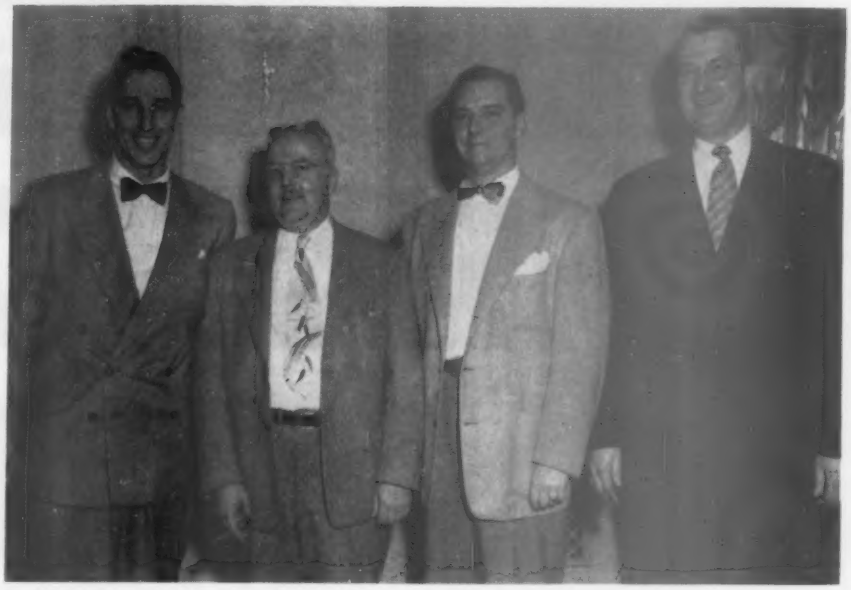
Manufacturers Meeting

The well-attended Manufacturers Division luncheon was held in the Boulevard room, with J. Craig McLanahan, chairman of the division, as the presiding officer. Wayne W. King said that 16 new members had been admitted to the division during the past year.

Irwin Deister, Deister Machine Co., Fort Wayne, Ind., was elected chairman of the Manufacturers Division; and L. A. Eiben, Northern Blower Co., Cleveland, Ohio; Wayne W. King, W. S. Tyler Co., Cleveland, Ohio; and B. R. Maloney, E. I. du Pont de Nemours & Co., Wilmington, Del., were elected vice-chairmen.

The following were elected to the board of directors: Irwin F. Deister, chairman, Deister Machine Co., Fort Wayne, Ind.; Leonard W. Beck, Cummins Engine Co., Inc., Columbus, Ind.; D. McM. Blackburn, Hendrick Manufacturing Co., Carbondale, Penn.; J. B. Bond, Nordberg Manufacturing Co., Milwaukee, Wis.; W. E. Collins, Jr., Atlas Powder Co., Wilmington, Del.; C. R. Dodge, Northwest Engineering Co., Chicago, Ill.; L. A. Eiben, Northern Blower Co., Cleveland, Ohio; R. F. Feind, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.; G. P. Fenn, Caterpillar Tractor Co., Peoria, Ill.; H. R. Harrington, Goodyear Tire & Rubber Co., Inc., Akron, Ohio; E. M. Heuston, Bucyrus-Erie Co., South Milwaukee, Wis.

G. C. Holton, American Cyanamid Co., New York, N.Y.; G. W. Hoskins, Harnischfeger Corp., Milwaukee, Wis.; G. H. Keppel, C. G. Buchanan Crushing Machinery Div., Birdsboro Steel Foundry and Machine Co., Birdsboro, Penn.; R. D. Ketner, General Electric Co., Schenectady, N.Y.; Wayne W. King, W. S. Tyler Co., Cleveland, Ohio; K. F. Lange, Link-Belt Co., Chicago, Ill.; Kenneth Lindsay, Iowa Manufacturing Co., Cedar Rapids, Iowa; B. R. Maloney, E. I. du Pont de Nemours & Co., New York, N.Y.; M. L. McCormack, Ingersoll-Rand Co., New York, N.Y.; J. Craig McLanahan, McLanahan & Stone Corp., Hollidaysburg, Penn.; H. W. Newton, Barber-Greene Co., Aurora, Ill.; D. J. Phillips, Austin-Western Co., Aurora, Ill.; L. A. Rhodes, Jeffrey Manufacturing Co., Columbus, Ohio; W. A. Rundquist, Pioneer Engineering Works, Inc., Minneapolis, Minn.; A. E. Schneider, Stedman Foundry & Machine Co., Inc., Aurora, Ind.; C. Darrell Smith, Joy Manufacturing Co., Pittsburgh, Penn.; and V. L. Snow, Euclid Road Machinery Co., Cleveland, Ohio.



Newly elected officers of the Manufacturers Division pose with the retiring chairman; l. to r., are J. Craig McLanahan, McLanahan & Stone Corp., retiring chairman; Wayne W. King, W. S. Tyler Co., vice-chairman; Irwin Deister, Deister Machine Co., newly elected chairman; and L. A. Eiben, Northern Blower Co., vice-chairman. B. R. Maloney, E. I. du Pont de Nemours & Co., was also elected a vice-chairman

At the concluding ceremonies, Beatrice Gay, secretary to J. R. Boyd, administrative director, N.C.S.A. was presented with a portable radio in appreciation of the aid which she has given to the Manufacturers Division. The out-going chairman, J. Craig McLanahan, was presented with an engraved gavel as a remembrance of his chairmanship. Cottrell Farrell, Easton Car and Construction Co., Easton, Penn., reported for the nominating committee and R. D. Ketner, General Electric Co., Schenectady, N.Y., presented a report for the resolutions committee.

National Gypsum Stock

NATIONAL GYPSUM CO., Buffalo, N.Y., at its annual stockholders' meeting, March 25, presented a proposal to raise the capitalization of the company from 2,500,000 to 5,000,000 shares of common stock. In addition, a stock-option plan, providing for the option of 50,000 shares of stock to executives of the company, was also presented to the stockholders for their approval.

Commenting on the proposals, Melvin H. Baker, chairman of the board, stated, "National Gypsum's capitalization, developed when the company was in its infancy, has become too restrictive because of the company's growth. Additional capitalization is urgently needed to take advantage of opportunities for future growth and to provide cash, if needed for expansion, by the sale of shares in a favorable market." He further stated that no plans had been made for the issuance of any part of the increased capitalization, but that it was simply a measure designed in preparation for future opportunities and requirements.

The stock-option plan was described as a method of assisting individual officers and executives to increase their holdings and thus tie them closer to the business. The plan would be limited both as to time it is in effect and the amount of shares available for purchase by any one individual. Bylaws of the corporation require that any increase in capitalization be approved by a majority of the shares eligible to be voted.

Vermiculite Booklet

THE VERMICULITE INSTITUTE, Chicago, Ill., recently announced that the booklet, "Vermiculite Plaster Fireproofing," has been enlarged and reissued. It is now an 18-page, illustrated booklet, presenting the latest summary of all fire tests on construction assemblies protected by vermiculite plaster, with new drawings, of typical fireproofing details.

Three points, explained in detail in the booklet, were brought out by recent fire tests of vermiculite plaster protection, namely:

1. That ceilings attached or furred to the bottom of primary members obtain the same fire rating as suspended ceilings.

2. That ceilings, whether attached, furred or suspended, may be used to protect primary as well as secondary members—individual fireproofing of primary members is not necessary.

3. That ceiling openings, within the area limits indicated, do not affect the fire resistance value obtained by a similar ceiling with no openings.

AGRICULTURAL LIMESTONE SECTION

Merchandising

Selling Health Over the Radio

Quality of crops from adequately limed soils is theme of advertising program to arouse public interest as well as that of farmer

By R. J. PLEASANT* and SAM B. SCHNEIDER†

Health from the ground up is shown in the stalk of corn at left. This corn received 2 tons of agstone, 200 lb. of 5-10-5 and 100 lb. of ammonium nitrate; its yield was 64 bu. per acre. The stalk at right received no treatment and yielded only 42 bu. per acre

TODAY, PRODUCERS of agricultural limestone are not only faced with the problem of selling their product, but are faced with the patriotic duty of helping the nation meet its food production goals.

As we pointed out at the National Agricultural Limestone Institute convention, in January, radio is particularly adapted to that job, because it gives the number one door-opener to folks' head and heart. Through radio, producers can tell the story of health—how they are not selling a mere "pile of rocks" to spread on the land—but are selling the health of the people and the spirit thereof.

Before describing the approach used in Oklahoma by Anchor Stone & Materials Co., Tulsa, it may be necessary first to take a look at the general agricultural picture.

Wars are fought for lands that grow high protein foods. Study the campaigns since history began and we find the conquerors heading for lands that are deep and black and contain limestone in quantity. Study the direction of Hitler, the direction of Stalin—they both want to take in the soils that produce protein foods. The buffalo and the fine Kentucky horses—all followed the strong lime soils.

Soils Relation to Health

It was Dr. William A. Albrecht, Department of Soils, University of Missouri, who reminded us that "our bodies are built from our soils. Our foods are fabricated soil fertility."

The fact is that our food which is being produced on millions of acres in the United States is being produced on land losing its minerals so rapidly that we are starving ourselves, in spite of the *quantity* of food we eat.

To see what that means to our country we look for a moment to Dr. Jonathan Forman, editor of the *Ohio State Medical Journal* and vice-president of the Friends of the Land (in the book by Dr. Lionel Picton, "Nutrition and the Soil," Devin-Adair Co., $4.00).

He says: "If we were to eat temperate quantities of the best possible food grown on soil that contained all of the essential elements . . . we would

*Anchor Stone & Materials Co., Tulsa, Okla.

†KVOO farm director and president of National Association of Radio Farm Directors.

live to a very old age . . . The starting point for the solution of our problem of how to get a strong, healthy and happy people living in an effective social order is in a healthy soil that contains all of the elements essential to healthy animal life. It becomes clearer as evidence accumulates, that the fundamental causes which determine why one individual will die and another will recover from the same disease at the same time; while a third individual will not even contract the disease, are not inheritance, shelter or climate but diet and nutrition."

Dr. Forman goes on to point out that mass production of our food to meet market demand will go by the way some day soon and we'll produce "food on the basis of the physiological needs of the population."

And Albrecht shows that the pattern of good teeth follows the pattern of fertile soils—the decline in soil fertility means decline in food quality and decline in health. "Sound teeth, like sound bodies as a whole, must be built from fertile soils . . ."

The downfall of many powerful nations of olden days was due in great part to their failure to conserve their renewable natural resources—study the history along the Tigris and the Euphrates.

Then, look to the future in the United States.

First, we have a million less farmers to produce food than we had last year at this time. Next, we have taken on, in the past six years, more people in the United States than there are today in Canada. In 1900 we fed five people from each acre of land in the United States; in 1950, we fed 10 people—the future calls for 15 people to be fed, clothed and sheltered from each acre by 1980. There are more than 60,000 new faces at the breakfast table every morning.

The brutal facts are that we must produce 50 percent more food in the next 25 years—and do it with fewer people and less land—if we are to have the amount of food now available on the dinner table.

All of this adds up to the fact that our quantity of food per person per year is on the verge of going down—no more surpluses such as we had in 1930. And as fewer farmers farm the same decreasing acres of less fertile land, to try to get more tons of food, the quality of that food will go down.

A Story to Tell

Now where does this leave the producer of agstone? It leaves him with a story to tell. Today's population does not realize what "hidden hunger" amounts to. Today's population believes too strongly that food is food if bought by the pound. So the agstone producer not only plays a large part in the future health and productivity of our country, but he has to show the population the part agricultural limestone is to play.

It is for this reason that Anchor Stone & Materials Co. joined with Sam Schneider, KVOO farm director, Tulsa, in 1945 to tell the story of hidden hunger and health and, through this method, to sell some agstone. On the signing of the 1952 contract for the program "Feed the Soil," the company began its seventh year of institutional advertising with a minimum of commercials.

We joined KVOO because we considered it the best medium for telling our story. Aside from a few small advertisements in 4-H and F.H.A. programs, we have stuck to radio all of that time, and are convinced that continuing radio "has made people conscious of the value of mineralized soil."

Our formula for selling health is simple; in fact, its success lies in its simplicity. Instead of selling the product, agstone, we sell the results. We sell the results it will bring in health to the individual who eats food grown on soils that have been "conditioned" for health with the use of agstone.

Our program now is one-half hour long because a shorter period didn't give us time for the music and other "sugar-coating" needed to sell our

THIS ARTICLE and the four immediately following cover the subject of merchandising agricultural limestone through the use of radio, newspaper advertising, billboards, direct mail and company-employed agronomists. Each of the authors is a specialist in one of these forms of sales promotion and has had singular success in his chosen program for merchandising.

All of them were speakers at the first annual convention of the National Agricultural Limestone Institute this past January in Washington, D.C., and were invited to write these articles to give greater emphasis, and with more details, on just how they go about building sales volume in their own market areas.

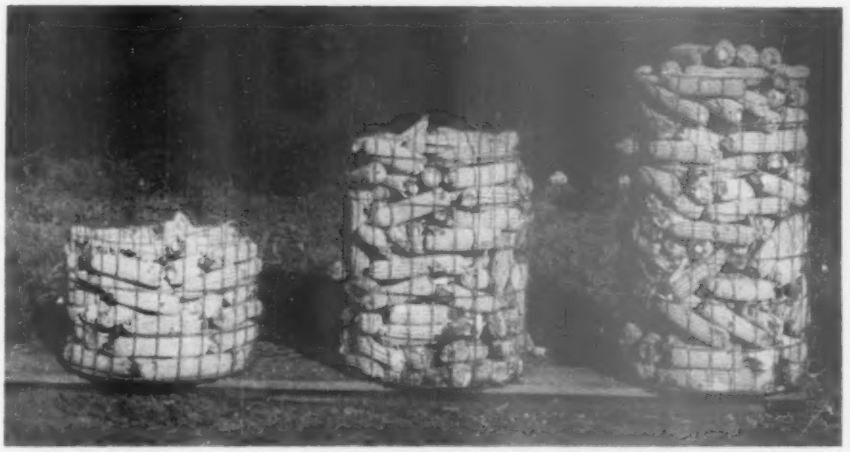
Each author is prepared to give assistance to other producers who might consider adopting a similar approach to selling and it might well be that a combination of several of these sales media might be the best choice, depending on local conditions.

Whatever the choice of method, it is extremely urgent that all producers of liming materials adopt and enlarge merchandising activities that will not only increase sales but protect themselves against any possible reductions in federal appropriations that may adversely affect the liming program.

This is an election year with all the uncertainties that go with it. The pressure is on for more economy in government and there can be no certainty that a satisfactory program for soil conservation will be maintained. The need for it continues great, as emphasized by agronomists who have proof that the annual applicaton of liming materials is less than half the requirements for a sound agriculture.

It is hoped that shortsightedness will not be permitted to deplete further our soil productivity but it also is to be hoped that producers will take steps to protect themselves and enlarge the use of agricultural limestone. Merchandising is the answer to both problems!

THE EDITORS



Graphic comparison of corn grown with and without treatment on a farm in Nowata county, Okla., shows both increased production and healthier looking ears in the stack at right. The corn at right yielded 74 bu. per acre with 2 tons of agstone, 200 lb. of 5-10-5 and 100 lb. of ammonium nitrate. The center corn yielded 63 bu. per acre with 2 tons of agstone and 200 lb. of 5-10-5. The corn on the left received no treatment of any kind and only produced 53 bu. per acre

story. We call on the staff organist for the old folk tunes, and we always put in a church hymn or two, the program being on Sunday. Then Mr. Schneider comes in for a five minute report on some phase of the problem of feeding the soil—for health's sake. We consider it important that we keep commercial comments to a minimum. In fact, 50 to 60 words per program are all that we use. An ordinary 30-min. program would use 800 to 900 words, but we figure that if we can develop the desire for health from the ground up, we'll take our chances at leading the field in the sale of limestone for the farms of the Southwest.

And that has proven accurate. As we signed the contract for the seventh year, Anchor Stone & Materials Co. continued to lead the rest of the agstone producers in this area in share of business.

Since the reports given by farm director Schneider are the heart of the entire program, a word or two about them.

They are prepared upon a general theme, which is repeated and proved by example time and time again. "If the minerals are not in the soil, they won't be in the plants, nor in the animals, and then they won't be in the people who live on the plants and animals. Nature, through her plants, selects the minerals in the quantity and type available for your health—if she has fertile soil from which to make the selection. But the minerals taken into the body in other form may not be available in the right quantity nor in a form available for use of the human body."

For instance, man thought he could out-guess nature in the case of fluorine to stop teeth decay. Recent findings have shown that even one part in one million of fluorine added to a municipal water supply may endanger essential body functions in people over 50 years of age.

Recently a Texas scientist told a House committee there should be further research on the effect of sodium fluoride on humans before it is used generally in municipal water supplies to prevent tooth decay.

From Anchor Stone & Materials Co.'s Sunday program: "A city should wait until laboratories have time to investigate further, Dr. Alfred Taylor of the Biochemical Institute of the University of Texas and the Clayton Foundation for Research, Austin, Texas, advised a House committee investigating use of chemicals in foods.

"It would seem that public interest would best be served by a more cautious attitude before instituting a program which involves adding a chemical to drinking water that is so toxic it has been used for years (in different proportions) as a rat and roach poison."

Our theme continues with: "Agstone is the necessary conditioner of the soil, so that other minerals will become more available for the plants. And, since health comes from the ground up, the final crop of the land is the people and the spirit of the people."

Current result stories from doctors, farmers, county agents, books, pamphlets and miscellaneous articles, in fact any source, are used to give examples of this theme and how it applies to the health of all of us. Most of the time Mr. Schneider tells the story himself, but on special occasions he calls in a doctor, farmer or some person to give a dramatic edge to proof that physical and mental health is one of our two major goals in this life—health is necessary before that other goal can be realized.

Thus we find ourselves as a *merchant* in this world trying to sell a pile of rocks that when crushed and applied to the land makes the crops grow more prolifically.

And more important, is that we find ourselves as a *citizen* in a world where food is being produced upon the assembly line in such a fashion that both quality and quantity are rapidly falling behind the demands for the health of our population. Therefore, we must lay aside the relatively unimportant role of merchant and take our place along with the many others in the role of saviour to the health of a population. If a population is not healthy, all the money in the world is of no avail.

Health is the final goal—not selling a pile of rocks. Because *health comes from the ground up*—and the *final crop of the land is the people and the spirit thereof.*

Merchandising

COMPANY AGRONOMISTS AID SALES

Activities include soil testing, trouble-shooting, farming recommendations, speeches before farm groups and stimulation of cash sales

By LOUIS J. DUSHEK*

THE FACT THAT the number of farmers that, until recent years, knew the value of agricultural limestone was exceedingly small prompted the United States Department of Agriculture to establish, as part of its service, an agency whose duty it was to teach those that needed it the correct use of agricultural limestone. This agency chose to use the subsidy method to get farmers to spread agricultural limestone on their fields. It appeared to them to be the most favorable and rapid method that could be used to solve one of our most pressing agricultural needs. Today, the government allotment to individual farmers is handled by the Production and Marketing Administration.

P.M.A. personnel may or may not have farm background. In either instance, they do not have the time to extract detailed agricultural information from reference books. A company-employed agronomist can be of great value to them with his readily available technical knowledge. As an agronomist employed by a producing company, The Callanan Road Improvement Co., South Bethlehem, N.Y., I try to contact each county assistant in conservation at his office at least once a month. During the course of conversation specific problems are frequently discussed. They may be in reference to delivery of agricultural limestone, proper application methods, soil testing, seeding practices or fertilizer recommendations. Also I am able to keep him up to date with our production and delivery rates in various parts of his county.

The county assistant in conservation has as his aides, county and community committeemen. They are farmers who are elected by their neighbors to do the signing up for conserva-

*Agronomist, The Callanan Road Improvement Co., South Bethlehem, N.Y.

tion payments for the practices that are completed on the farm. These committeemen frequently have questions asked them by the farmer whom they are signing up that they cannot answer. It is of utmost importance that I keep in touch with these men. I find that I am able to answer most of their questions on the spot. A few I take home and then search the answer out of references.

Aiding the Farmer

Regarding agricultural limestone, it is important to stress the proper rate and placing to get the greatest return from their investment. Many times I am directed by a committeeman to a farmer who has a problem in this respect. It is not possible to do a satisfactory job of making recommendations for agstone from a car or office. I feel that it is absolutely necessary to make soil tests in the field in the presence of the farmer. He can give me the history of past treatment and his future plans. Then by combining this information with what I find from the test I can do a better job of recommending lime, fertilizer, seeding mixtures and management practices.

Agricultural limestone cannot be sold alone. It is not a cure-all, but one of the several keys that are necessary to unlock the door to economical production. Part of the job of a company-hired agronomist must be to give the farmer as complete a cropping plan as is possible for the fields that are being considered. Suggestions as to the best varieties of seed and grain to sow are absolutely in order. Methods of establishing new seeding in meadows and pastures are important. Rates of application and analysis of fertilizing that are most economical must also be suggested. It is only from a well-rounded program that a farmer can be expected to obtain satisfactory results. Also it is from the success that he achieves from these recommendations that he bases his confidence in the company agronomist.

There are always some members of the community who are not farmers, yet they are interested in hearing about agricultural limestone. Then there are social organizations that consist of both farmers and nonfarmers that are also interested in agricultural limestone. As part of their organizational program, they invite speakers to give them something interesting. I have had that type of invitation many times, and by using slides or movies of local interest it is possible to entertain and teach at the same time. Company agronomists should always take advantage of this medium for distributing knowledge.

It can easily be seen that if the agronomist depended upon personal contact as the only medium of advertising, it would take too long to do a satisfactory job. The use of easily

Louis J. Dushek, company agronomist for The Callanan Road Improvement Co., South Bethlehem, N.Y.

read articles in local papers and the *Farm Bureau News* are helpful. If it is possible to use a mailing list, it would get your information directly to those you wish to contact. I write the advertisement for our company each month and try to make it appropriate for the season. In the fall during fair time we have had exhibits at two fairs each year. This brings both the name of the company and the product before many people. Also it affords the opportunity to make additional contacts.

Ambassador and Teacher

During the course of the year there are bound to be instances where the customer is not entirely satisfied for various reasons. Since serving the farmer is a bit different than dealing with purchasers of crushed stone and bituminous concrete, an agronomist, I believe, is the ideal person to help keep the farmer and the company on good terms with each other.

What has been said so far deals with the immediate value of an agronomist. I believe that there is much more to look forward to in the future from the company's point of view. At the present time a company cannot depend upon its next year's sales volume. This is due to the way the farmers purchase agstone. Also there is only about 23 percent as much material being used as should be used in our area. It is the duty of a company agronomist to stimulate the direct cash purchase of more agricultural limestone. At the same time he should stress the economic importance of proper application of agricultural limestone. By doing this, he can increase that percentage figure and reduce the fluctuation of annual production.

Some of the most important work that can be done is with boys taking agriculture in high school. They will be our farmers of tomorrow. I have taken one group through our plant, showing them the production of crushed stone and agricultural limestone. This year I plan to include all other agricultural classes in our area. In addition, I am showing them demonstration plots that show the effect of soil acidity on the growth of legumes and grasses. These plots also show the value of various seeding mixtures. If an agronomist can have some plots or a farm to show the value of good practices, it is a great asset for future advertising.

Many farmers take a great deal of interest in the recommendations made by a company-employed agronomist. If he is able to make many contacts with all sizes and types of farms, he soon becomes known. The proof of his effort is when the farmers are having better results than they have had before. It could be said that a company-employed agronomist is also a "good-will ambassador."

With agstone as a conditioner, the corn at right far surpasses the other rows. The corn at left received 2 tons of agstone and 200 lb. of 5-10-5 at planting time; corn in the center received no fertilizer; corn at right received 2 tons agstone, 200 lb. of 5-10-5 at planting and 100 lb. of ammonium nitrate applied at second cultivation

Selling Agstone by Direct Mail

Catch-phrases, verse and humorous drawings used effectively to capture attention of farmers

By W. E. STONE*

AS LONG AS ARTICLES of any description have been sold we have had advertising. In the early days when we had none of our present-day advertising media, the article to be sold had to be shown to the buyer to make a sale. This is still good, but volume sales make it impossible to contact every prospect in person.

With the development of printing, newspapers and magazines became a valuable medium for advertising. With the growth of mail delivery came advertising pieces which carried the appeal to the prospective buyer. Then came outdoor billboard, radio and television.

All of these methods have proved valuable under certain conditions and in certain areas of the country. Not all methods of advertising seem to work successfully in all areas.

Through my 30 years of interest in promoting and selling agricultural limestone, I have seen all of the above media used and, in fact, we have tried most of them and find they are all good under the right conditions.

In the early days of proving the value of agricultural limestone in an area, we used field demonstration. We use displays at fairs and are always available to talk conservation.

But through all the years of changing conditions and large and competitive channels of advertisng, we have still continued to do some direct mail advertising.

We find that direct mail advertising is expensive and not effective unless it goes to a list that has been screened and held down in size.

It has been pretty well proved that 5 percent are leaders and 95 percent are followers. We work on this theory and in new territory we have our dealers furnish us with the names of 25-30 of the better farmers and ones that they consider good prospects. We then supplement our dealers' efforts with direct mail pieces in the belief that if we can sell just a few of these leaders that others who watch the leaders will also order.

Changing conditions through the years have forced us to change the type of direct material we send.

Thirty years ago the active farmer read everything he received. In fact he looked forward to getting the weekly paper and a bit later he looked for the daily paper, from which he got market news and news of the world. Then he was interested in news and information which he could get in no other way except through the press.

Today he turns on the radio for his market report and his choice news

*Sales manager, Piqua Stone Products Co., division of Armco Steel Corp., Piqua, Ohio.

SICK SOIL-
Soil becomes sick when it loses the minerals and natural fertility that once made it healthy, productive soil.
Sick soil produces poor crops of low feed value.
Poor quality crops produce poor, unhealthy livestock - sick livestock.
Sick livestock makes slow gains - expensive gains and costly by-products.
Crops from sick soil - livestock from sick crops - add up to poor returns from your investment and your effort.
They may add up to poor health for your family.
Every member of your family needs calcium (limestone) for healthy teeth and bones - for general good health.
SICK CROPS
PRODUCE POOR
UNHEALTHY LIVESTOCK
HAVE YOUR SOIL TESTED!
-- find out if it is needing limestone or fertility. If your soil is sick - the treatment is very small compared to the returns you will get after the cure.
Very sincerely yours,
W. E. Stone
Sales Manager, Agricultural Limestone Division
PIQUA STONE PRODUCTS CO., PIQUA, OHIO
Div. of Armco Steel Corporation

Example of direct mail piece used by Piqua Stone Products Co.

reporter and then spends the evening listening to the entertaining programs of radio, and by ever increasing numbers to television. By the time he gets his newspaper he has already heard all the headlines.

The results of demonstration, research and education he gets by these easy methods. We try to supplement all these with simple, easy-to-read direct mail. Direct mail pieces then must be brief and must have some illustration to catch attention and quickly tell a story.

Mountains of material showing results from experiment stations can be sent showing the wonderful returns from use of agricultural limestone, but few farmers will read it.

Getting the Message Across

The direct advertising piece must be able almost at a glance to connect the word lime or limestone with some problem on his own farm—more profit, better livestock, or better health for his family.

If a producer can find some character or expression which he finds interesting to his prospects then he should use it and continue using it. Use short simple statements with the illustration. If a producer does nothing more than get the word lime or limestone connected with profit, quality of product and better health he has done a good job in not only selling the farmer but also his wife.

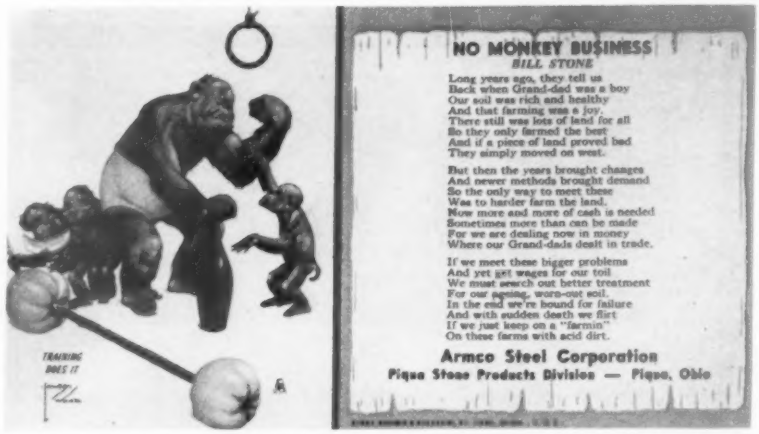
In this connection I have for several years used simple verse to try and tell a story with material that most farmers will read. In the beginning I was convinced that it was worthwhile because of the number of farmers who wrote verses to me about agstone.

To make this material of interest I have used monkey blotters and, where sending it as a letter, have monkey characters mimeographed along with the message in verse. Everyone seems interested in monkeys or monkey pictures so I have tried capitalizing on this thought by heading this material with "No Monkey Business." The heading seems to get a good percentage of readers.

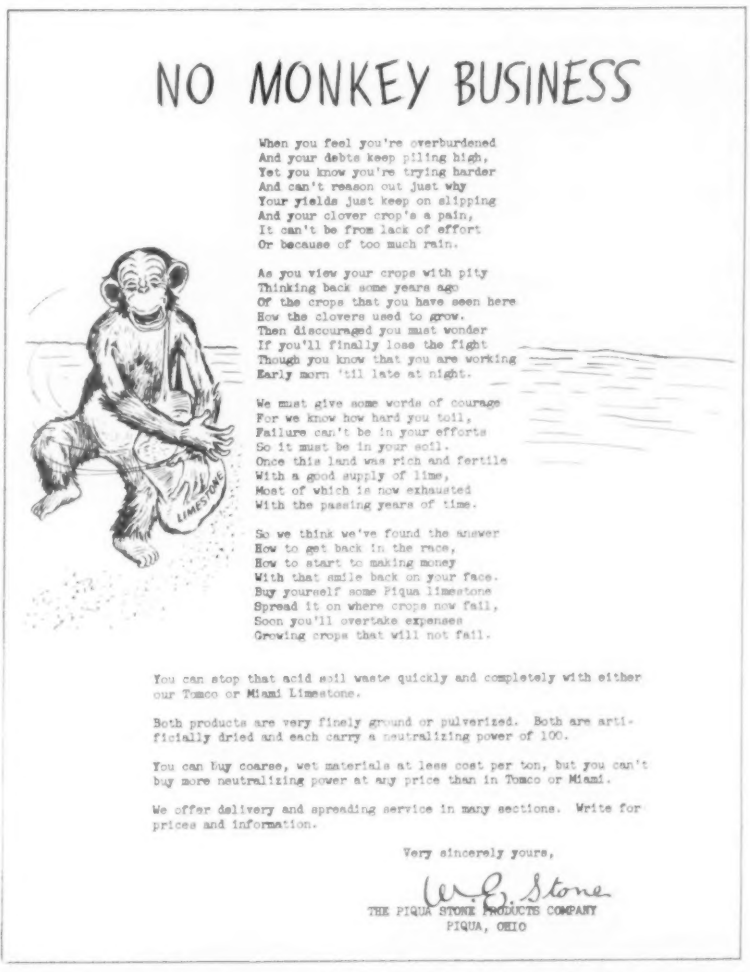
The letters with verse are sent to a rather large mailing list. The blotters are used mostly as mail pieces, as calling cards and to pass out to prospects who come to the office.

Few families can find a blotter when they need one—school children like the monkey pictures and, needing blotters, will carry them to school. These blotters get circulation.

The verse is crude and simply written, but somewhere in it is the word lime or limestone. In these direct pieces I try to put into rhyme some problems of the farm that can be helped or cured with the use of limestone. The verse idea makes it easy to read and as it's read, another imprint of lime or limestone is made in the mind of the reader.


TRAINING DOES IT
NO MONKEY BUSINESS
BILL STONE
Long years ago, they tell us
Back when Grand-dad was a boy
Our soil was rich and healthy
And that farming was a joy.
There still was lots of land for all
So they only farmed the best
And if a piece of land proved bad
They simply moved on west.
But then the years brought changes
And newer methods brought demand
So the only way to meet these
Was to harder farm the land.
Now more and more of cash is needed
Sometimes more than can be made
For we are dealing now in money
Where our Grand-dads dealt in trade.
If we meet these bigger problems
And yet get wages for our toil
We must search out better treatment
For our ageing, worn-out soil.
In the end we're bound for failure
And with sudden death we flirt
If we just keep on a "farmin"
On these farms with acid dirt.
Armco Steel Corporation
Piqua Stone Products Division — Piqua, Ohio

Blotters have been used effectively by Piqua Stone Products. Printed in bright colors, both the picture and the verse about farming practices emphasize the fact that there is "No Monkey Business" about agstone's usefulness to the farmer. The blotters are used mostly as mail pieces, as calling cards, and are passed out to prospects who call at the company's office


NO MONKEY BUSINESS
When you feel you're overburdened
And your debts keep piling high,
Yet you know you're trying harder
And can't reason out just why
Your yields just keep on slipping
And your clover crop's a pain,
It can't be from lack of effort
Or because of too much rain.
As you view your crops with pity
Thinking back some years ago
Of the crops that you have seen here
How the clovers used to grow.
Then discouraged you must wonder
If you'll finally lose the fight
Though you know that you are working
Early morn 'til late at night.
We must give some words of courage
For we know how hard you toil,
Failure can't be in your efforts
So it must be in your soil.
Once this land was rich and fertile
With a good supply of lime,
Most of which is now exhausted
With the passing years of time.
So we think we've found the answer
How to get back in the race,
How to start to making money
With that smile back on your face.
Buy yourself some Piqua limestone
Spread it on where crops now fail,
Soon you'll overtake expenses
Growing crops that will not fail.
LIMESTONE
You can stop that acid soil waste quickly and completely with either our Tomco or Miami Limestone.
Both products are very finely ground or pulverized. Both are artificially dried and each carry a neutralizing power of 100.
You can buy coarse, wet materials at less cost per ton, but you can't buy more neutralizing power at any price than in Tomco or Miami.
We offer delivery and spreading service in many sections. Write for prices and information.
Very sincerely yours,
W. E. Stone
THE PIQUA STONE PRODUCTS COMPANY
PIQUA, OHIO

Humorous drawings and verse tied in with the catch-phrase "No Monkey Business" are used in much of the direct mail to get the farmer's attention and at the same time tell a story about agricultural limestone. The letters are sent to a large mailing list and seem to get and keep the attention of a large number of farmers

One of the billboard signs used along Iowa highways. Each poster is used for 60 days and then replaced by the posting company with a new one with another message about agstone

Billboard posters prove economical method of stimulating and holding interest of farmers

By CLINT A. ALLEN*

BILLBOARD POSTERS PROMOTE SALES

"IT PAYS TO ADVERTISE" is a phrase that has been used by many and for a good many years, and is just as true today, if not more so, as it was when the first shopkeeper advertised his merchandise in the far distant past. Advertising in newspapers, magazines, on radio, television, movies, etc., has become a part of our daily life, perhaps at times a tiresome part, but nevertheless important.

Another advertising medium that has taken its place in modern merchandising is the highway billboard sign. All of us at times have thought there were too many of these billboard signs along the highway that sometimes obstruct our view of the countryside, but often they offer us wonderful suggestions and in many instances have been helpful.

The agricultural limestone industry has a product to sell. It isn't a commodity that can be portrayed by pictures of beautiful bathing beauties. It must be displayed in some manner to create human interest and along educational lines as to the values of its use. Many agstone producers have used newspaper advertising, radio and direct mail, either individually or through association sponsorship. "Trailer films" have also been used in local moving picture theaters. There isn't any question that all of these several methods have created interest and have possibly sold many tons of agricultural limestone.

However, all of the above forms of advertising, though they are good, eventually become too costly to continue over any length of time.

Outdoor Advertising

In 1950, the board of directors of the Iowa Agricultural Limestone Association decided to look into the possibility of using outdoor billboard advertising. A committee was appointed to investigate such a plan of advertising agstone.

The committee contacted an outdoor billboard posting company, which provides billboards for rental. This company in turn contacted a poster printing company. A meeting was held, the committee submitting the ideas to be portrayed on the outdoor signs. They asked that it be made attractive enough to catch the eye and yet tell the story about agricultural limestone and the value to be had by its use. It had to create interest and yet must be of an educational nature.

The poster printing company's artist did an excellent job of drawing up in picture and word form the ideas as submitted by the committee. A series of six posters was finally presented. These posters and the ideas they carried out were so designed that they could be used on a seasonal basis, giving an entire year-around program. The committee was told by the posting company that, under almost any circumstance, these posters could be used for a period of 60 days each. It was also said that in contracting for rental space for outdoor billboards it was much better to contract for year around use of the signs. Renting on a hit-and-miss proposition sometimes resulted in not having the desired location or proper timing; in some instances no space was available at all.

The first year's program of billboard advertising was started in November, 1950. Each poster was numbered, from one to six, number one being used for November and December and finally ending with the number six poster in October, 1951. In all, the association placed 53 of these poster series along highways in Iowa. A producer in Wisconsin, one in Illinois, and another in Kansas also used these posters during this first year. During the summer of 1951 another series of six posters was designed and these are now being used not only in Iowa, but also by the same two producers in Wisconsin and Illinois and one in Tennessee.

A picture in black and white of one of the current posters shown here may not appear too attractive without colors, but it can readily be seen that they would attract considerable attention. All of these have been printed in beautiful fast colors that will not fade and remain an attractive display for their life of 60 days.

Having gone into this form of advertising for the second year, the Iowa association feels it has found the best way to advertise agstone at a nominal cost. It is foolproof, in that there is no worry or bother for the producer once he has contracted to have these signs placed in his territory.

First, he contacts the outdoor billboard company which has rental bill-

*Executive secretary, Iowa Agricultural Limestone Association, Inc., Des Moines, Iowa.

board space in his territory. Next, he contracts for the posters and indicates how he desires to have his company name printed at the bottom of the poster. This finishes his part of the arrangement. The posters are shipped to the company which will service his signs. It takes care of placing them on the billboard at the proper time. The producer can sit back and for 365 days each year his product, agricultural limestone, is being advertised, along with his name in large black lettering—telling the general public of the virtues of this commodity and how easily they can purchase it.

The cost of this form of advertising, in most instances, will run less than $1 per day. It has been as low as 75 cents per day, depending on location of rental space. What other form of advertising can the producer purchase for that kind of money? Remember, that 24 hr. per day and 365 days per year these signs are out working for the producer and agstone.

Iowa producers are sold on billboard advertising, along with a few producers in other states, for plugging the use and usefulness of agricultural limestone.

Merchandising

Advertising in Newspapers

Effective program stresses "dollar return" in crops to farmers as a result of liming

By EARL P. HOLWADEL*

OHIO GRAVEL Co., Cincinnati, Ohio, uses a newspaper advertising promotional campaign that is doing an excellent job of creative selling.

The advertisements are published with regularity and the main objective is to show farmers the good experiences of others as the result of liming.

From the beginning, the company starts with the theme that liming pays and follows through with subsequent ads showing a picture of the farmer, as well as the subject of interest, and his comments on the liming program on his farm and its results. A signature plate is shown on the bottom of each ad.

Ohio Gravel Co. has found it essential to engage a professional newspaper photographer to get the pictures used in the advertisements. Information and ideas come from county agents, P.M.A. agents, and others in the area as to specific achievements on the individual farm—finding that the farmer is as proud of his work as would anyone else be on some other commercial example.

After the advertisement has been run, the picture is sent to the farmer, in which event we have found that the entire family has shown a lot of interest. The company's campaign has featured two counties in Ohio and this publicity reaches throughout the next county in which event interchange of news is advantageous. At various times, merchants and especially bankers are called upon, wherein the banker cooperates to the extent, as in one instance, announcing his bank desires to loan money on well-managed farms, along with an explanation of this statement, which is done over the company's signature plate.

After photographs are taken, the newspaper man interviews the farmer and prepares the story. The ads feature a variety of farms, such as cattle breeders, hog raisers, grain raisers, fruit growers, poultry farmers, and others. In a good many instances, we show the dirt farmer, the fellow who is unshaven and out in the field working.

Machinery distributors have shown a lot of interest in this program due to the fact that from time to time their specific equipment is shown. We like to suggest that this thing has the appearance of a game—in showing one farmer as compared to another, the results that can be obtained from the use of lime and the use of improved practice. This program can be long-range and is inexpensive. The ads can be reproduced in any other territory which might be desired, thus enlarging the scope of our area or an interchange with other producers.

We keep a bound record of this whole story and prepare separate copies for our agents to use for themselves as well as to give creative discussion with the customers.

In summing up this situation, we have been agreeably impressed with the reaction, finding that farmers have been anxious to participate in this program and in some instances have asked to be considered where we have been unable to find a subject of interest on their individual farm. The product which our company manufactures is not as high in quality as that of some other producers so that this procedure has indicated to us that we can profitably serve this area with a recommendation of using an increased amount per acre in which case it appears that satisfactory results have been achieved to the mutual profit of ourselves and the farmers.

Our advice has come from competent newspapers such as the *Cincinnati Enquirer* and other smaller papers where, in each case, an adequate knowledge of advertising was obtained.

Put In A Dollar
Get Four In Return
THOMAS R. HILL
Here's What Mr. Hill says:
"I figure that every dollar I spend for lime brings in four — in cash returns. Take the problem of pasture as an example.
"Before the lime program went into effect I could pasture one cow on every three acres of grass. Lime so increased the yield that today I can pasture one cow per acre — during every month of the pasturing season.
"The same story goes for corn. My yield has jumped from 28 bushels per acre to 50. Wheat crops have increased from 12 bushels to 20. And what the use of lime has done for clover is amazing. It's possible now to pay for the entire liming cost by the sale of seed from my clover fields — and still I have all the fine clover hay for winter feed.
"DO I USE LIME! I'D BE FOOLISH IF I DIDN'T!"
OHIO GRAVEL CO.
OGCO AGRICULTURAL MEAL
East 2700
Cincinnati, O.
5225 Eastern

The "dollar return" is emphasized in all the farming examples illustrated in the advertisements. Note that the company name is carried prominently at the bottom of each ad

*Sales manager, Ohio Gravel Co., Cincinnati, Ohio.

AGSTONE

Markets for Agstone Hinge on Merchandising and Improved Service

Liming during off-peak periods solution to increasing agstone sales. Producers comment on desirability of owning or hiring spreaders

By BROR NORDBERG

A RE-APPRAISAL OF THE REQUIREMENTS for agricultural liming materials, as determined by agronomists, has established a figure of approximately 80,000,000 tons as the annual need for the nation's farms. By comparison, the largest tonnage spread in a single year has been slightly more than 30,000,000 tons, which means that the producers of liming materials have a large potential to shoot for which presents a tremendous challenge.

To accomplish this goal, or even to approach it in a reasonable period of years, will require concentrated effort in several directions. A greatly accelerated program of merchandising is essential, by the industry and by individual producers, to sell the farmer and to keep him sold on the economic merits of liming. Several articles in this issue of ROCK PRODUCTS tell how leaders in the agricultural limestone industry are effectively doing that job. Some of them are actively and continuously selling the public, as well as farmers, the need for liming on the premise that everyone has a stake in agriculture if we are to continue to enjoy good health. An informed public is the best insurance that elected federal public officials will continue to give active support to programs that will recognize the necessity for sound soil conservation practices.

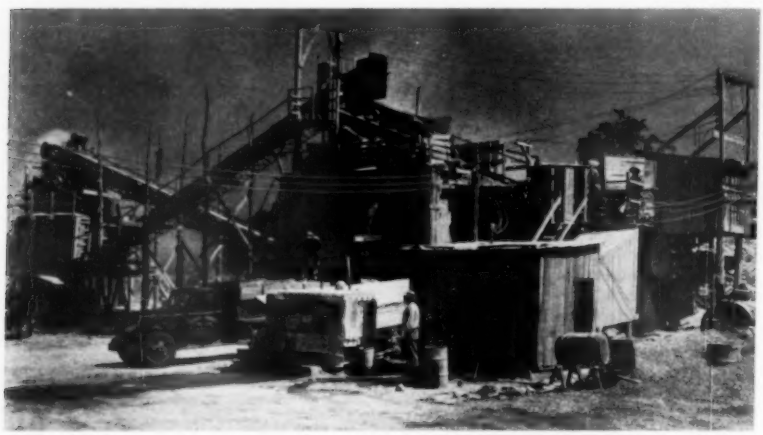
Improved service to the farmer and cooperation with him in every reasonable respect can increase the annual tonnage spread by a substantial amount. The development and perfection of the spreader truck and the increasing use of such equipment has been of great importance to the growth of the industry and the maximum effective use of spreading equipment will, to a large extent, be necessary if the annual tonnage applied is to be increased to any considerable volume.

Not only will there be need for more such equipment but maximum use must be made of units now available, whether they be owned by producers or by independent truckers or dealers. The seasonal nature of farming activities presents a real challenge to the industry; the farmers' schedules of planting and the effects of unanticipated heavy rainfall have cost the agricultural limestone industry millions of tons of production annually.

To the extent that the majority of the farmers in an area are permitted to follow the practice of wanting their liming materials spread in the spring months, and sometimes in the fall after the crop season, the industry will be unable to realize peak volume of sales. In many areas, inability to meet the demands during the two peak periods has meant permanent loss of tonnage, either because it is not economical to gear production to such peak demands or because spreading equipment could not be made available.

The answer lies in educating the farmer to the fact that there is advantage to him in liming during the off-peak periods, which would spread sales throughout the summer months. Building stockpiles of finished product during off-peak production months is a partial hedge against loss of sales during the months of peak demand but is not entirely a solution to the problem of service to the farmer and to most effective merchandising.

Many producers do not have their own delivery and spreading equipment only because little volume of agstone is moved during six or eight months of the year. Some of them, otherwise, would prefer having their own spreading equipment as a means to giving better service to the farmer. Having control over the delivery and the actual spreading of the agstone would permit prompt delivery and control over workmanship that would reflect in still increased business. The independent trucker with spreading equipment is the chief contact man for many producers and he could and would do a better job in every respect if he could count on more steady employment.



Output at this Kentucky crushing plant is 750 tons of agstone and commercial stone daily. The plant is diesel-powered

Own or Hire Spreading Equipment?

We asked producers of agricultural limestone to comment on the advantages or disadvantages of owning or hiring spreading equipment and

whether or not they are attempting to promote the spreading of liming materials throughout the year and how they are doing it to lessen the impact of peak demands. Response to our letter was gratifying and we thank those who took the time to help bring us up to date.

It was surprising to us that 32.5 percent of companies in our sample, which we think representative, own their truck-spreading equipment. In addition, 5 percent both own and hire such equipment. Among these, spreader trucks are hired to help during the peak months or spreader trucks are owned mainly to handle off-peak period orders.

Thirty percent of our sample hire spreader trucks exclusively and the balance (32.5 percent) merchandise agricultural limestone through dealers or more commonly through contractor-truckers who buy the material and sell it to the farmers. It is mainly the large volume producers who use dealers, in merchandising over a wide area, and some of the smaller volume producers in sections of the country where soil conditions are such that liming tonnages are comparatively light per unit area.

Where sales are through dealers, most of the tonnage is hauled by rail from the producing plant and the dealer is responsible for the unloading, hauling, spreading and all the service rendered. He does the direct selling and is given support and usually the benefits of advertising and promotion by the agstone producer.

Those who sell to vendors, or independent truckers, cite many advantages while others have adopted the practice because the nature of the territory that must be served and other economic factors dictate that policy or they otherwise would prefer having their own facilities to service the farmer directly.

One concern in Oklahoma that has vendors in 12 counties says that 50 spreader trucks would be required if the company delivered and spread the agstone itself. This company is promoting the idea that the vendors obtain unloading equipment and stockpile materials near points of use in efforts to encourage spreading throughout the summer months. Invoices are being given 60-120 day dating to encourage the practice. A firm on the West Coast has its distributors stockpile agstone, in serving a 300-mile area by rail.

Selling through independent truckers has its advantages and its disadvantages, depending much upon the availability and dependability of truckers and their equipment in a specific territory. Most independent trucks evidently have interchangeable truck bodies and, during off-peak seasons, haul aggregates, coal and spread sand or cinders on highways during the winter season, etc. Where these other activities by the truckers are scheduled secondary to limestone spreading, the producer feels he need not concern himself about investing in equipment which may be idle much of the year.

Winter operations at a crushing plant in Iowa. The diesel engine pictured powers the jaw crusher, conveyors, screen and feeder

Some producers of considerable volume, in areas where truckers are adequately equipped, report that the trucker is effective in stimulating sales and in distributing some of the sales over the calendar because he, the trucker, has taken great interest in keeping his equipment busy. That experience is not true in many other cases. Independent truckers are used by some of the large producers, principally of commercial crushed stone, because the producer is reluctant to compete with truckers who handle crushed stone from the same plant.

In certain areas where the independent trucker is well established, they are credited with having intimate farmer contacts that are valuable to the increased distribution of liming materials. Other reasons given for sales to, or through, truckers are the attitude of labor, inability to hold a force of drivers, the heavy investment required for small tonnages and the expense of truck equipment upkeep. Many producers are concentrating on giving the trucker maximum service, by installing storage bins and speeding up loading time.

Those producers who own spreader trucks are, for the most part, producers in rural areas who depend principally on agricultural limestone for their main business and they are interested in rendering the best possible service to the farmer. A considerable number own their equipment because they cannot rely on the outside trucker for prompt deliveries as requested and for good, uniform spreading that they consider necessary for best results to the farmer. Ownership gives them the control over their business and the personal contact between the company and the farmer which they consider essential to building good will and increased volume.

They maintain supervision over the drivers who, they say, become expert in doing the job well on the farmer's fields. Some of these companies, too, have interchangeable bodies and do other trucking in the off-season months.

It is of interest that practically all producers who replied to our letter are actively promoting the spreading of agstone through the off-peak months and results are starting to show. Newspaper advertising, radio, personal contacts with the farmer, promotion through the efforts of company-employed agronomists, increased storage facilities provided at the plants, use of special informative literature, billboards, meetings with farm groups, educational films and cooperative work with county agents are the means being employed to break the farmer of the habit of rushing the spreading of agstone all during the spring or fall seasons.

Producer Comments

Among comments received on the relative advantages and disadvantages of company-owned spreader trucks as compared to independent truckers were the following.

A producer in Kansas who also produces crushed stone, sand and gravel and ready-mixed concrete: "We hire our spreading equipment. We do not own spreading equipment because spreading is seasonal. It is cheaper for us to hire independent haulers who are willing to change from dump work to spreaders. If we were terribly busy we would rather own spreading equipment, but under the circumstance it is to our advantage to hire it."

* * *

New York: "We own about one-half of our spreading equipment and hire the other half. We prefer the same

uninterrupted volume of business which outside truckers do and some arrangement must be made for the use of the equipment during the off-season and during rainy weather.

"The advantage which hiring spreading equipment has over owning spreading equipment is the fact that the spreader equipment is idle so much of the time. The advantage of owning your own equipment is that better control can be exercised over the actual spreading operations. The use of your own equipment also enables you to keep your fingers on the cost of spreading service."

* * *

Minnesota: "We own our spreading equipment. The advantage is that we have the equipment available when needed and can control the type of service."

* * *

Oklahoma: "We do not hire or own any agricultural limestone spreading equipment. We sell our material to independent trucking contractors who spread the material with their own trucks.

"We can see no advantage in owning spreading equipment. The business of selling, unloading, hauling and spreading of agricultural limestone is a business that needs close supervision and the truck owners are better able to do this than a producer."

* * *

Iowa: "I have ten trucks that do my hauling and spreading. Seven are owned and operated by me and the other three are hired by the ton to haul and spread. I do not sell any limestone to truckers as I want to control the spreading business. In most cases the man who does the delivering to the farmer is the contact man with the farmer. It is important to have meetings with the truck drivers and instruct them to always do the best job of spreading they can, to be courteous to the farmer and to be careful about the gates so as not to let the stock get out.

"I feel that I have gotten a lot of business through good spreading. If a farmer wants, say, 3 tons spread to the acre on a certain field, he does not want part of it covered at the rate of 4 tons per acre and the balance at the rate of 2 tons per acre because the hauler did not know how to spread and after he got about one-half done, saw he was not going to get the field covered with the alloted tonnage so he had to cut down so as to cover the field.

"I think the advantage of owning spreading equipment is that you have a lot better control over the spreading. Also, it is impossible to have a hired trucker keep his lime box on his truck during the summer months when there is gravel or crushed stone to haul on the roads. Usually, during the summer months, I leave two of the trucks equipped with limestone spreaders to take care of orders we receive for pastures or summer fallowing. I put dump boxes on the rest and haul stone or gravel during the summer. I also do contract resurfacing work and that seems to work nicely along with the limestone business. There is little road work in the spring before we get the limestone business finished. In the fall or late summer after harvest, when the limestone orders begin to come in, the trucks are pulled off the road work as they are needed to take care of the limestone business. If you had to depend on hired trucks for this entirely I am afraid it would not work out too well."

Service to Farmer Important

Kansas: "We have some very definite opinions concerning this subject, opinions formulated from experience in the field of selling agricultural limestone. We are of the opinion that a dependable service of delivering and spreading must be available to the farmer before any volume of business can be expected. Volume is of first importance in the selling of agricultural limestone.

"As to whether the producer should own spreading equipment, or contract the delivery and spreading, we realize that the nature, character and size of the trade territory may influence this decision considerably.

"We are serving 25 counties in north central Kansas, and own a major share of the spreading equipment we use. We do, however, hire extra trucks and equipment in peak seasons, and subcontract three counties. We are forced to do this because of the size of our trade territory.

"Experience has taught us that the service rendered is at least 50 percent of the limestone spreading program and considerable attention and planning must be directed toward that end. To control the type of work done, and to facilitate the planning, it is necessary to control the equipment. To control the equipment means owning it, as hired equipment is not dependable enough.

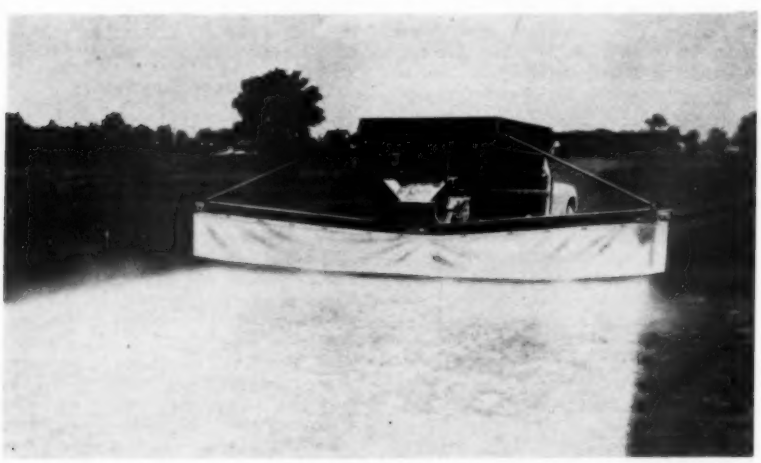
"The design of our truck beds furnishes us a utilitarian bed for hauling crushed stone in off-seasons, and does a good job of spreading agricultural limestone. The use of this combination bed allows us to make the maximum use of the trucks.

"Just a word of warning to the producer who is toying with the idea of owning his own spreading equipment. The delivery and spreading charge should be figured high on the initial venture into the spreading field. Many times, this first cost is considerably higher than the operator anticipates.

"Each spreading operation offers a separate problem, and records should be kept by each trucker and on each piece of equipment, so that a definite operational cost can be established. Consequently, it is important that the operator keep his offer fairly high until he has established a pattern of his own spreading operations. Normally, the producer will be able to operate more cheaply with his own equipment rather than through a subcontractor. This is understandable, in that the subcontractor has to make a profit on his spreading operation, and the producer has to supervise the work himself if he expects to establish a reputation for reliability and good service. In the long run, the final cost which the producer must charge will obviously be lower and will therefore be competitive at all times."

Contract Hauling

Pennsylvania: "We hire all of our spreading equipment in the spreading of our agstone and have hired all of our trucking equipment for the past seven years. When we originally start-



One of the spreaders on the market, the Hercules chain conveyor type, spreads agstone over a 20-ft. area at a single pass. A two-chain drag conveyor moves the material at a uniform rate from the bottom of the welded steel hopper-type body to the discharge throat. From this point, the material is dropped onto diagonally cut distributor plates and is moved along the entire length of the discharge arm. Note the wind-breaking canvas skirt

ed in the agstone business in 1943 we purchased our own equipment and placed it in operation, but we soon found that due to the seasonal nature of this work that we could not keep good drivers employed sufficiently regularly to warrant doing it ourselves.

"We established a rate so that our outside truckers could make good wages on the days they operated and have also insisted that all 13 of our hired trucks be owner-operated. Most of these truckers have other sideline activities such as hauling coal, wood, and other materials so that they do make a good livelihood from their combined operations."

* * *

Missouri: "We own two spreader trucks and hire two to four more depending upon the season."

* * *

Pennsylvania: "We own our spreading equipment and do not rent spreading equipment. We feel it desirable to own our spreading equipment because of the fact that our customers want their limestone at specified times and it is not always possible for us to hire equipment at the time it is needed."

* * *

Kansas: "At the first of this year we began to hire our spreading done. Owing to adverse weather conditions we had not been able to hold a crew of men together to drive our trucks. As to how hiring truckers will work out we have not given it sufficient trial to answer.

"Having such limited experience in hiring spreading equipment, I can only comment from our experience in owning spreading equipment. I believe that by owning your equipment you have a closer control over the quality of the spreading. The disadvantage is that, in this locality, spreading is seasonable and subject to weather conditions. To hold a crew of men for spreading ran our spreading costs too high."

* * *

Ohio: "We do not own spreading equipment. A truck driver spreading agricultural limestone must have 'farm sense.' Many truck owners operate their own equipment. Others have other work to keep drivers busy in off limestone seasons.

"The owner-operator or owner who is with his drivers will see that limestone is not delivered when the ground is too soft. He will see that trucks are better taken care of.

"We could not hire help to man these trucks when limestone could be hauled and then have work for them the rest of the time, as well as several truck owners can do.

"Our men haven't the farm knowhow of satisfying the farmer. They would not take as good care of equipment. If they had a breakdown in transit or in the field, we would have to keep extra mechanics and equipment to drag them in and fix the equipment."

* * *

Indiana: "We own our spreading equipment. So long as we own our equipment, it is readily available on call.

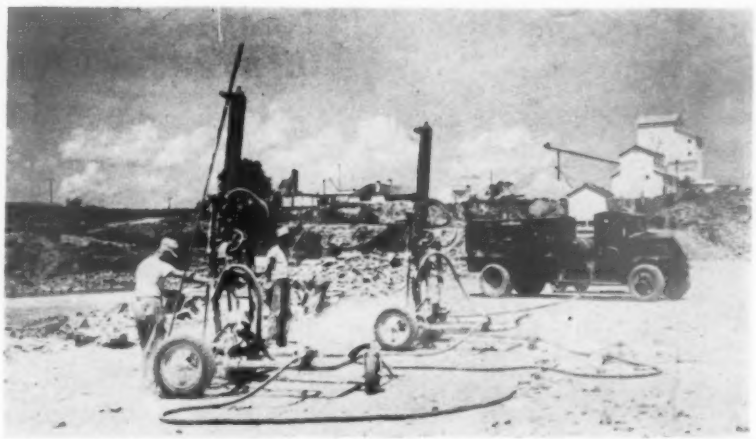
"By owning our equipment, we have full control over the drivers. We can stress more plainly that the farmers' requests in spreading must be satisfied, so long as feasible. There is never any kick-back on the equipment so long as we own it. It is true that the overhead is greater, but it increases our volume, and unless the government takes it all, there is more left in the end too, to put back into the company, and improve equipment for better service with varied types of service in spreading."

* * *

Iowa: "We own almost all of the spreaders operating from our plants. During our peak season we operate about 20 spreader trucks.

"We find that men driving our equipment can be supervised much more closely and the farmers benefit from much better spreading jobs. It seems that most of the independent limestone haulers that we have had any experience with are more interested in big daily tonnage rather than in trying to do the best possible spreading job.

"We would say that the main advantage of owning our spreading equipment is better service to our customers which makes more repeat business. Also by keeping the same drivers spreading year after year we have developed some fine agstone salesmen, while the independent trucker who might haul gravel or livestock when he wasn't hauling agstone is at a definite disadvantage both in knowing how to spread the material and in direct selling."



A 500-cu. ft. portable compressor furnishes compressed air to wagon drills on this job in a Wisconsin quarry

Selling Through Personal Contact

Oklahoma: "I own my equipment. I find that personal contact is the best method in selling liming materials. You can answer questions that circulars leave unanswered. I try to talk farmers into liming crop land during the months the ground is laying idle. I talk them into liming pasture land during the summer months. By owning your own equipment, it is always available when needed."

* * *

Iowa: "All our limestone is sold at our plant to the independent trucker.

Use of portable equipment in a semi-permanent crushing operation in Oklahoma. Power is supplied by diesel engines

Caterpillar diesel D4 tractor and Trackson Traxcavator loading agstone from a stockpile to spreader truck

The independent truckers solicit lime spreading business to get the hauling and, in this way, we keep our investment down and our sales expense at a minimum. We have approximately 30 truckers which means we have 30 salesmen. We advertise in the local papers the year around. The ads are written to call attention to the different types of liming for the different seasons of the year.

"We have had no experience in owning or hiring spreading equipment but there are numerous advantages to our system of operation. The trucker deals directly with the customer and is under obligation to give the best possible service to get repeat orders. A large portion of the sales expense is shifted to the trucker. Repairs and other trucking responsibilities are eliminated. In hiring trucks the transportation tax has to be considered. In selling the materials at the quarry a much smaller investment is required."

* * *

Ohio: "We do not own, neither do we hire spreading equipment. We sell direct to truckers who own their spreading equipment who in turn sell to the farmers. Whenever we have agstone under contract, we do hire the trucker to do the unloading, hauling and spreading which constitutes approximately one-sixth of our business.

"The reason that we do not own spreading equipment is that we find it cheaper to sell direct to truckers and we find that they, in most part, are good salesmen for our product and most of them try to stay in business as long as possible each year. Therefore, we find that we have a longer uninterrupted volume of business per year."

Michigan: "We hired all our spreading done until two years ago. However the truckers would not work as steady as we desired so we have gone to our own spreading equipment now. This works out better because we can see that the tonnage gets spread. Before we had no control over truckers."

Stabilizing Business Volume

Pennsylvania: "Our company does not own any of its own spreading equipment, although we do sell quite a bit of limestone on that basis. However, we do own a great many of our own trucks which haul bagged lime and our other products.

"Perhaps our locality differs from others but the supply of spreader trucks from outside sources has always been adequate, and we believe will continue to be adequate, despite the rather seasonal volume of business of this nature. It had not been our desire to purchase spreader trucks because of the fluctuation in the volume of business, and we lean heavily toward an all-purpose truck that can be used year-round. We would like to note that many of our leased spreader trucks are used by the Pennsylvania Department of Highways for cindering purposes during the winter months.

"The trend toward more and more agricultural limestone, much of it on a spread basis, has made it difficult to stabilize the volume of business to keep a constant volume flowing. A step toward solving this has been our construction of six 80-ft. concrete silos and two star bins equipped with Fuller-Huron Airslides and equipment to store agstone at off-peak seasons and speed up delivery tremendously in busy seasons.

"The relative advantages of owning or hiring spreading equipment in our area will tend to change as more and more farmers request spread limestone. Up to now we have depended entirely upon leased spreader trucks, because the supply of them has been adequate and the seasonal variation therefore did not affect us in having idle equipment, since we can revert to bag lime hauling with our dump trucks. However, as pointed out above, this may continue to change so that the owning of spreader trucks will be necessary for an adequate supply and adequate control of deliveries."

Promoting Application of Agstone

Insofar as efforts to promote greater application of agricultural limestone other than during peak periods, typical comments were as follows:

Iowa: "To try and stabilize a constant volume of business I carry on quite an extensive advertising campaign. I use billboard advertising as well as running ads in the newspapers in the territory, but we have not had too much success selling agstone during the summer months."

* * *

Ohio: "We promote the spreading of liming materials through pamphlets, ads in local newspapers and through local truckers, in trying to get them to take material in off-liming seasons. The trucker is rather good at this, since sometimes in busy seasons he has to wait for material."

* * *

Oklahoma: "We are constantly promoting the sale of agricultural limestone 12 months of the year and the independent distributors are doing the same. We are of the opinion that soil can be limed at any time during the year and get good results. We are asking the county and state P.M.A. offices to apportion their agricultural limestone money over 12 months out of the year as nearly as possible. However, we have been unable to obtain 100 percent cooperation on this for a number of reasons. We are using direct mail advertising to the farmers, a different pamphlet every two or three months."

* * *

New York: "We are trying to stabilize the volume of business over a nine to ten months' period by the use of advertisements in the *Farm Bureau News* and by word-of-mouth advertising by our company agronomist both to farmers individually and speaking before farm groups. Cornell University, in all its literature to New York farmers, is pointing out the better service which farmers can get during the off-peak seasons and we are playing up this fact."

* * *

Virginia: "We ourselves are not doing too much towards promoting the

spreading of liming materials throughout the summer months other than by making available copies of all the latest bulletins and pamphlets which are issued by the various agricultural agencies and our limestone association and our truckers are out trying to promote the spreading of liming materials throughout the summer months."

* * *

Ohio: "We use direct mail in the trucking area for year-round spreading. There is no best time to apply limestone. We encourage applying limestone on wheat on frozen ground —applying after hay crop is cut.

"We test many samples of soil for farmers and, knowing the weather and soil conditions, crop to be limed, etc., we can recommend a good place to apply to fit into the slack seasons."

* * *

Pennsylvania: "We do have a full-time salesman and agronomist in our organization who is constantly covering our trade area in an effort to stabilize and improve the volume of our business through soil testing on the farm, contacts with the farmers, and in showing educational films and slides which he has acquired from Pennsylvania State College."

* * *

Kansas: "We are continually engaged in an educational program informing the lime-consuming public in the proper methods and use of agricultural limestone. The application of agstone 6 to 18 months ahead of legume seeding has received considerable attention in this program. We have made considerable progress, but still have a long way to go. Farmers on the whole are in the habit of securing their needs the day before the need arises. This habit should be broken, but of course will take time."

* * *

Ohio: "The peak of our business is during the late summer months and early fall. After wheat harvest, hay harvest and corn harvest are the periods when our demand for agricultural limestone is greatest. We are attempting to increase the demand for our product during the winter, spring and early summer months. To a more or less degree we are seeing this accomplished."

* * *

Alabama: "We promote the spreading of liming material through the summer months by advertising directly to the farmers."

* * *

Indiana: "Advertising of various kinds helps to stabilize lime spreading through the slump periods. Direct contacts are a help too. Since the spring and fall rushes always cause a few farmers to be left out on getting agstone when they most want it, they have changed their programs to the extent of liming off-season when possible. We advocate plowing down limestone in many cases, which lets us spread the lime sooner and it is sufficiently effective turned under anyway. We also do laboratory soil testing which is also a big help in making recommendations in spreading of lime."

* * *

Illinois: "We advertise the desirability of spreading agricultural limestone all year in local papers, at local fairs and through the local truckers."

* * *

Tennessee: "We have been carrying a radio program on our local station which reaches the counties we serve, urging farmers to use agstone and also to use it throughout the year rather than just in the spring and fall. However, our winters have been so wet the last two or three years that it has been practically impossible to spread during the winter months."

* * *

South Carolina: "We have been pushing the spreading of limestone during the summer months, particularly for pastures, but most of the demand still is for the first and fourth quarters. During the spring and summer, South Carolina farmers are preoccupied with tobacco and cotton and are not interested in agstone. And, while pastures are being extended, the progress has not been rapid enough to make any appreciable change yet in the off-season demand."

* * *

Ohio: "For the past 12 years we have been doing our best to level out the peak shipping seasons. Our efforts to date have been reasonably successful, but there is a long way yet to go. We know of no single remedy for the situation; we believe that the cure lies in a multitude of small remedies applied with due regard to local conditions as they exist."

* * *

Wisconsin: "In the past we have used direct mail advertising to stimulate limestone spreading in the summer months but the volume of business is limited from planting time until after the first crop of hay is cut in the spring.

"Weather conditions are more of a problem than having a steady volume of business. There are so many days that the land is not fit for spreading—as far as we are concerned that is the biggest problem."

Closes Lime Plant

WARNER CO., Philadelphia, Penn., has closed down its McCoy lime plant and sold it to Bethlehem Steel Co. Cedar Hollow's shaft kilns, in addition to those at the McCoy plant have been shut down, and one of the company's products, lump lime, has been discontinued, as was recently reported in "Warner News."

The installation of the No. 2 rotary kiln at Cedar Hollow will increase the company's production of dolomitic lime to the extent that the burning of stone in shaft kilns is no longer required. The McCoy plant was the second lime company purchased by Warner in the early 1900's.

Phosphatic Fertilizers

A NEW PLANT for the manufacture of phosphatic fertilizers without the use of sulfuric acid is in operation at Ruedersdorf, near Berlin, Germany, where large lime deposits have been worked for many years, as was recently reported in *Chemical and Engineering News*. The plant is the first one in Soviet-controlled East Germany for the production of phosphates from apatite concentrates which are imported from the Kola peninsula in the Arctic region of the Soviet Union. No sulfuric acid is being used for the process; instead, the apatites are treated with a by-product of the local potash industry, according to the report. The process employed has not been revealed.

Spreading trucks waiting to be loaded at a crushing plant in Iowa during winter operations

AGRONOMISTS' VIEWS ON SPECIFICATIONS

Opinions vary on physical and chemical requirements of agstone, importance of trace elements and whether nutrient value or soil neutralization is objective of liming

By BROR NORDBERG

RECENTLY, SOME PRODUCERS of agricultural liming materials have expressed concern because of suggestions made that specifications might be enacted in their particular states which would place acceptance or rejection of their products under the control of political organization. The purpose of such proposals purportedly is to protect the purchasers of liming materials against inferior products.

Established producers of agricultural limestone have no objection to the purpose that their customers get a good product for their money but they believe that the agronomist, who is a soil expert, and not a political body, is best fitted to establish standards that should apply according to conditions as they must be met.

This subject of specifications is the one that is very controversial and involves so many considerations other than fineness and so called "neutralizing value" that there is much doubt that rigid standards should be enforced to the letter over a given state.

Agronomists themselves do differ somewhat in their interpretations as to the main purposes of applying liming materials but, whatever their point of view, they have been instrumental in making recommendations to suit given soil conditions that have been effective in marked improvement in agriculture.

Since the subject of requirements for effective liming is of such live and current interest, we have asked recognized agronomists in the leading agricultural states to express their opinions on the subject of specifications. Specifically, we asked them to outline the physical and chemical specification requirements that apply in their areas, to comment on how rigidly they think specifications should be enforced, and to express their opinions as to the importance to be attached to chemical requirements including any trace elements that might be present in liming materials.

These agronomists were very cooperative in their desires to help clarify the subject on short notice and their response was generous. A number of letters was received and, in addition, several short articles which we publish herewith along with some of the more informative letters.

These agronomists, even in the states which have laws governing the quality of liming materials, take the point of view generally that economics and differing requirements between farming areas and individual farms often make it unwise to enforce specifications to the letter. As expressed by one agronomist, the objective from the point of view of the farmer is to secure "effective neutralizing oxides at the cheapest rate." They recognize that a certain limestone of lower neutralizing value than another one may actually prove a better buy.

The important thing is to evaluate the purpose of the product. Most of our correspondents have proved to their own satisfaction that correction of soil acidity often is the chief purpose of liming and accordingly believe that physical and chemical specifications should be established for most economical and effective soil neutralization.

Whereas the specification for fineness of product may require that 80 or 90 percent pass a No. 8 sieve and, say, 20 or 30 percent go through a 100-mesh sieve, with a minimum neutralizing value of 85 or 90 percent $CaCO_3$ equivalent, many believe variations not only are permissible but sometimes desirable. Since the $MgCO_3$ fraction of a limestone or dolomite is much more insoluble than the $CaCO_3$ portion, that must be considered in establishing the neutralizing value based on calcium carbonate equivalent. Furthermore, if the soil has a pH below 6 they believe it desirable to have more 100-mesh fines if the limestone has appreciable $MgCO_3$, to accelerate neutralization.

The nutrient value of magnesium is recognized even by those agronomists who believe that correction of soil acidity is the chief function of liming. Much of our midwestern soils require magnesium and they are guarding against deficiency in magnesium in areas where the immediately available limestones are predominately high in calcium.

Most of the agronomists, with some notable exceptions, believe that the trace elements available in liming materials are too negligible in amount to be of importance in evaluating the material. However, in Kentucky for example, all the limestones contain the lesser mineral elements in quantities that are considered important. Minor elements occur in amount up to 20 lb. per ton of limestone. In Wisconsin the presence of phosphorus is considered important. In other states, opinion seems to be that the presence of trace elements must be established by test and be guaranteed to justify taking into account. Differences in hardness and porosity generally are considered of questionable value.

Generally, on the subject of specifications, where it is believed that there should be some latitude before rejecting a product because of variations in grinding, etc., the opinion is that the producer should guarantee his product to have certain properties and that price should be based on those figures. In some states, where a relatively coarse grade of agricultural limestone is specified, with all crusher fines retained, to obtain early action along with greater durability, a finer ground product of higher analysis is advocated, where haulage distances are so great as to justify the added cost.

Opinions vary somewhat between states as to desired fineness of product. Generally, 50 to 60 percent minus a 100-mesh sieve seems preferred where relative speed of neutralization is desired such as in Indiana. In the eastern states it is common to require that all or nearly all the product pass a 20-mesh sieve, where No. 8 or No. 10 are the top preferred screen sizes in most of the midwestern states. The limestone rating system whereby the percent passing a No. 8 sieve multiplied by the percent calcium carbonate equivalent must equal or exceed [illegible]

is the one specification most common in the Midwest.

Among those who strongly advocate that liming is of value for its nutrients rather than as an acid neutralizer is Dr. William A. Albrecht, University of Missouri. His studies show that relatively coarse limestone is more effective than fine ground material which he attributes to the fact that we do not want to neutralize the soil. He maintains that some acidity is desired in spots throughout the soil so that the plants can obtain elements which would be made insoluble in alkaline soils. Coarser particles of limestone would supply calcium at a slowly regulated rate while leaving acid spots which other roots seek to take up other nutrients. He believes that mill-run agstone of 10-mesh top size is entirely satisfactory.

Among comments received on the subject of specifications were the following.

Connecticut

B. A. Brown, agronomist, Storrs Agricultural Experiment Station, University of Connecticut:

Connecticut has no laws or regulations dealing with agricultural liming materials and it is the consensus that none is needed.

For the purpose of contracting for large amounts of materials and giving farmers credit for liming practices under their program, the Connecticut P.M.A. officials have published in their annual leaflets the following specifications:

"Standard ground limestone is defined as ground limestone which will analyze at least 50 percent total calcium oxide neutralizing equivalent, 98 percent of which will pass through a 20-mesh sieve, with a minimum of 40 percent passing through a 100-mesh sieve, and which contains all the finer materials produced in grinding. Magnesium oxides will be given a weight of 1.39 when converting to a calcium oxide equivalent.

"Equivalents for liming materials other than standard ground limestone will be established by the state committee, taking into consideration the oxide content, fineness and moisture content."

The P.M.A. specifications reflect local agronomic ideas on agricultural limestones. I might add that where quick decreases in soil acidity are essential or where limited, short time effects are desired, hydrated lime is usually recommended. In most cases, dolomitic limestone or hydrated lime is preferred because of the rather common deficiency of magnesium in the naturally acid soils of the state.

To my knowledge, there is no evidence that any elements in agricultural limes, other than calcium and magnesium, have had any appreciable effects on the soils or crops in Connecticut.

Illinois

F. C. Bauer, professor, Agricultural Experiment Station, College of Agriculture, University of Illinois:

There are, as we know, some quality differences in agricultural limestone. They occur in both the physical and chemical properties. Sometimes particle size tends to run somewhat coarse. Sometimes the neutralizing equivalent drops to rather low levels. For the limestone resources of Illinois there is little occasion for a coarse product with low neutralizing value. An effort should be made to avoid these extremes.

On the other hand there is no need to overemphasize fineness. A product containing both fine and coarse particles is likely to give the best overall long-time results. The finer particles will provide for quicker availability and the coarser particles for greater durability. A high neutralizing value is a desirable quality but a premium 'for the highest possible values in this respect is not essential.

Specifications of this general nature in Illinois have made it possible for Illinois farmers to purchase and apply large tonnages at moderate prices. The long-lasting qualities of such applications obviates the necessity for frequent use of small amounts of a higher priced product. Using limestone in this manner has been an important factor in the total efficiency of Illinois agriculture for many years. This situation needs to continue.

Occasionally Illinois farmers have obtained limestone running heavy in coarse particles and low in neutralizing value. To correct this, the Illinois Agricultural Experiment Station devised a limestone rating system. It was based on combining a screen score with the neutralizing equivalent and defining limits of variation. Periodic checks on the supplies going to farmers have done much to bring about improvements. Whether there is a need to do more than this on the matter of limestone quality improvement and enforcement is open to question.

On the matter of the value of limestone impurities to the soil, I have no information as to the claims being made. The major value of limestone lies in the carbonates of calcium and magnesium supplied. Whether other material present would be useful in crop production would depend upon the need of the plant for them, on the deficiency of them in the soil, and whether they would be supplied by the limestone used in amounts sufficient to affect plant growth. I have no information at hand which would permit me to make a positive statement on this question.

Minnesota

Paul M. Burson, professor, Department of Agriculture, University of Minnesota:

The limestones being used in Minnesota are those that have been agreed upon with the Production Marketing Administration. These specifications require that at least 80 percent pass through an 8-mesh screen and that there is at least 80 percent calcium carbonate equivalent, or neutralizing value. The product of the two must equal at least 0.72. This means that a limestone product that has an 80 percent calcium carbonate equivalent must have at least 90 percent through an 8-mesh screen.

Whatever specifications are set up or provided for should be carried out the same as any specifications for other materials that might be applied to the soil. Abuses can occur with the agricultural limestone product the same as in any other type of product.

We do not consider that other impurities in limestone are of any particular consequence on Minnesota soils. The important thing is to provide material that has sufficient fineness and reasonably high quality as far as neutralizing value is concerned.

Missouri

William A. Albrecht, chairman, Department of Soils, University of Missouri:

In a paper "Plant Nutrition and the Hydrogen Ion: V. Relative Effectiveness of Coarsely Ground and Finely Pulverized Limestone," published by the University of Missouri, we point out clearly that the function of limestone is not one of using the carbonate to reduce the degree of acidity, but one of using the calcium and the magnesium to nourish the plants with those elements as nutrition.

As long as we continue to believe that we lime in a fight against soil acidity instead of an attempt to offer nutrition to the plant, we shall continue to have questions of how fine, etc. However, I think if you will read this paper, you will see that we take the viewpoint that with a few scattered focal points of limestone fragments where the acid clay has dissolved that rock to load the clay with calcium and magnesium we shall have the points at which the plant root can be nourished with those essentials for which the limestone is used. With this concept of using the limestone as a raw mineral to feed the plant by means of the acid helps in the soil, I think this whole point will be clarified.

In our work the use of the fine lime in rates of two tons did not last as long, nor was it as effective in establishing sweet clover as were the applications of two tons of coarsely ground limestone. The fine fragment, of course, serves quickly to offer nutrition, but it is the coarser particles which are focal points and allow for the grass to get nutrition later.

Then there is the danger of neutralizing any soil with calcium if we should use extremely finely powdered materials. We are not anxious to saturate the soil with any one element. The soil must carry a suite of ions

that represent the particular plant diet to the best advantage. Therefore, excessive applications to the point of neutrality by means of the limestone would be a serious error.

Most of the agricultural limestones passing a 10-mesh sieve, mill-run material, have been doing so well that it would seem scarcely valuable to split hairs in trying to refine this matter much more.

North Carolina

E. R. Collins, head, Agronomy Extension, North Carolina State College of Agriculture and Engineering:

During the fiscal year July 1, 1950, to June 30, 1951, the total sale of mixed goods and fertilizer materials as reported by the manufacturers was 1,849,467 tons. In order to assure the farmer received the amount of nitrogen, phosphoric acid and potash guaranteed by the manufacturer, the control officials of the North Carolina Department of Agriculture sampled and analyzed representative fertilizers being offered for sale.

Should each farmer use the amount of fertilizer recommended by the Experiment Station, the quantity used and crop production would have been increased materially.

During the same fiscal year, limestone for commercial distribution amounted to 424,973 tons. As in the case of fertilizers, representative samples were analyzed, and the contents of calcium carbonate and magnesium carbonate were reported in the bulletin of the North Carolina Department of Agriculture.

Conservative analysis as to the amount of limestone which could be profitably used by the farmer would indicate that the present consumption is considerably less than one-half the amount required for maximum economical production. Since it is recognized that liming is important from the standpoint of supplying calcium and magnesium as a plant nutrient, as well as creating the proper soil reaction for best crop production, there would appear to be no reason why the farmer should not have equal protection relative to the analysis of his liming materials as in the case of fertilizer materials or mixed fertilizers.

Since some areas in this state are low in magnesium, the relative content of calcium and magnesium are important to the farmer in selecting the kind of limestone which he is to use on his particular farm. Frequently, the farmer selection is based on a soil test showing the relative level of calcium and magnesium in his soil.

Since the degree of availability of a ground limestone is dependent upon the degree of fineness of grinding, the minimum screening standards for agricultural liming material were adopted March 15, 1948, by the North Carolina Board of Agriculture. This regulation specifies that agricultural liming materials shall conform to the following minimum screening standards:

100 percent must pass through U.S. standard 10-mesh screen, with a tolerance of 5 percent.

50 percent must pass through U.S. standard 100-mesh screen, with a tolerance of 5 percent.

Preference of some farmers for bagged, dry ground limestone, because of the ease of uniform distribution and thorough mixing with the soil, should not mean that all farmers should be required to use this material. With proper precautions, wet bulk limestone can be spread uniformly and properly mixed with the soil to effectively neutralize soil acids. Therefore, the physical condition should permit those with facilities to use the cheaper bulk material, with the dry lime available for those desiring to use it.

It is recognized that some fertilizers and liming materials may contain impurities which may be helpful to plant growth. Where the impurities have been shown to have a beneficial effect on crop growth by the Experiment Station, and the concentration is sufficient to justify the use of a particular material in comparison to other materials, such plant food elements or compounds could be claimed, providing they are determinable by chemical control methods. In the absence of sufficient proof as to the beneficial effect on crop yields, or in the cases of low concentrations, claims for such materials would be confusing to the consumer and would detract from the major reasons for liming, with associated increases in crop production.

Ohio

Earl E. Barnes, assistant professor, Ohio Agricultural Experiment Station:

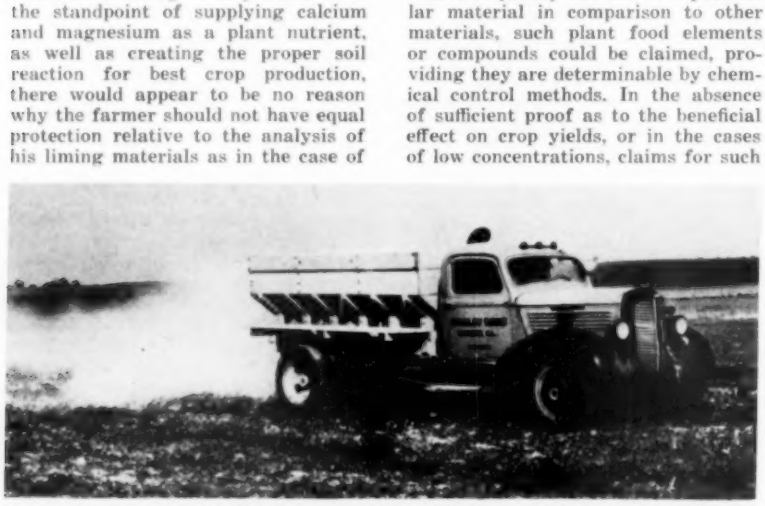
I believe that the chemical specifications needed are those usually given, i.e., the percentage of Ca, Mg and the total neutralizing power expressed in terms of $CaCO_3$ as equal to 100.

The physical specifications usually given are not so satisfactory. Everyone agrees that the rate of solution of limestone is a function of the surface exposed, and that this in turn is a function of fineness of grinding. All control laws with which I am familiar attempt to define fineness in terms of the percentage of material which will pass screens of different fineness. This is, of course, better than nothing, but it would be an improvement if the fineness could be expressed in one figure, or at least in fewer figures than is the case when the percentage which will pass four or five different screen sizes are required.

In line with this idea I interested myself some years ago to see if some simple method could not be devised which would measure surface directly. I finally came up with a method which was published in *Soil Science*, Vol. 63, No. 4. I am not concerned whether or not the details of this method are adopted or not, but some such attempt at measuring surface directly is sure to be better than a multitude of screen tests. A surface measurement alone is not enough to correctly define the material. It should be supplemented by data on which percentages will pass a 20-mesh sieve (or a sieve of about that dimension).

Our work here would indicate that material coarser than 20 mesh is so slowly soluble that it can be neglected as a source of material to affect the immediate neutralization of an acid soil. The reason why one screen percentage is desirable is that it would be possible for a producer to mix some very coarse, practically worthless material with some very fine material, like precipitated carbonate and still have a surface (due to the very fine material) which is as great as that of material from which all the very coarse material has been excluded. This very fine precipitated calcium carbonate may have a specific surface of 200, so that a material could be compounded which contained only ⅓ of this and the rest too coarse to contribute much of anything to the surface and still the mixture would have a specific surface of 40, which is the average specific surface of satisfactory liming material sold in this state as "agricultural ground limestone," but whose action in the soil would be

(Continued on page 124)



An average of more than 2,000,000 tons of agricultural liming materials have been applied annually to Wisconsin farm lands over the past six years. (This figure includes papermill sludge, beet sugar factory waste and marl.)

PRESIDENTIAL CANDIDATES' VIEWS ON CONSERVATION

Democratic and Republican presidential aspirants give expression to their views on soil conservation

THOUGH NO ONE can state clairvoyantly who will be the presidential candidates nominated by the Republican and Democratic parties until the Chicago conventions in July, the position that avowed aspirants have taken with respect to agricultural conservation programs is of interest to a great many. Here, in black and white, are printed answers to a letter sent by ROCK PRODUCTS to nine men, presidential hopefuls and dark horses, Democrats and Republicans. This letter requested an answer stating attitudes toward present and future agricultural conservation programs. Replies are in alphabetical order. Favorite sons not committing themselves are listed at the last.

Dwight D. Eisenhower. Though General Eisenhower cannot comment upon specific legislative programs until he takes off his uniform and returns to this country, his attitudes are contained in a statement, made over a year ago while president of Columbia University, to the high school students of Texas, praising an essay contest sponsored by the Friends of the Land.

"Today one penalty we pay for past mismanagement is a shrinking productivity on millions of acres of our land. More than this, with deterioration of the natural resources with which this continent was originally so abundantly blessed, there has arisen a fear among many Americans that starvation and want will overtake them as soon as their own productive years in industry have been completed. Obsessed with this fear, which is intensified by the acute interdependence of each of our productive groups upon the others, many are turning to government for a guaranteed lifelong security. We risk the loss of independence, initiative, and courage because of increasing sterility in the fields . . . Fortunately for us, we can stop erosion and, in many instances, restore assets. The knowledge of experts in all fields of conservation is adequate, or is becoming so. All that we lack is the nationwide, fixed determination to put that knowledge to work."

Senator Hubert H. Humphrey (D., Minn.). "The demands for production from American farms are increasing steadily, and they will continue to increase as our population grows in the years ahead. Our farmers will have to get this bigger production from the acres now in cultivation, because there is little new land left.

"In the face of this situation, we find that the productivity of much of our soil is still deteriorating. To me, the answer is clear. We need more—not less—conservation on American farms.

"A lot of progress has been made during the last 15 years, under the conservation program authorized by Congress, but we are not yet doing enough. The work must be strengthened and expanded in line with the essential needs.

"Protecting our soil and water resources is important for farmers themselves. It is even more important for the general national welfare. If we fail to guard against loss of soil fertility, our standard of living will inevitably fall—and the entire economy will be steadily weakened.

"This is obviously a national responsibility, and not just something to be left to the initiative and resources of individual farmers.

"For these reasons, I feel that cooperative efforts like the Agricultural Conservation Program should by all means be continued and improved. Financial assistance given farmers in applying lime and fertilizer—and in carrying out all the other approved practices which protect our basic soil resources—is an investment in our future strength and security."

Adlai E. Stevenson, Governor of Illinois. Mr. Stevenson has denied seeking the presidential nomination, and is running only for re-election in Illinois. Because of this, he has not expressed his views on many national issues, including agriculture directly. However, one of his statements is given here as indicating the trend of his thinking.

"Some cynics say we are not what we like to think we are—individuals capable of making intelligent decisions regarding our own affairs. I am not among those who hold such a view. I believe that in 99 cases out of a hundred, the American people will make the right decision—if and when they are in possession of the essential facts about any given issue."

Earl Warren, Governor of California. Excerpts from an address by Governor Warren at the National Association of Soil Conservation Districts, Cleveland, Ohio, February 26, 1952.

"Crops are becoming poorer because nutrients are being washed from the soil even though the latter remains. One of our experiment stations reports that water has carried out of each acre in that area, in solution, approximately 65 lb. of nitrogen, 150 lb. of potash and 140 lb. of calcium in a three year period. The tonnage of soluble nutrients carried by the Mississippi river in a single year is staggering—almost beyond belief. . .

"There are those who say that we cannot afford a comprehensive conservation program. It is my firm belief we cannot afford not to have such a program. During and since World War II we have spent for war or defense of this nation of ours the equivalent of $1000 for every acre of land in the United States. Another world war could well cost ten times that amount. Suppose we should be obliged to spend that amount and at the same time see our natural resources dwindle in some instances to the vanishing point. Who would then pay the bill? Who would be able to feed and clothe and house our people, or sustain our industry?

"Conservation programs flow from education. If they fail to impress the moral sense as well as the business judgment of the farmer, timber operator or the community, no arbitrary power of government could enforce them. . .

"I contend that through costly years of trial and error it has been conclusively proved that our national welfare calls for American agriculture to be protected from boom and bust cycles. Those of us who recognize the right of every segment of our society to a measure of security realize the necessity for governmental programs which safeguard farm prices from collapse. Likewise, those of us who insist upon freedom of enterprise under rules that are fair to all contend that the bolstering of our agricultural economy fits snugly into the same pattern through which industry has so often received federal benefits. No program which erects a safeguard against farm bankruptcy needs to be a threat to freedom of enterprise."

Not replying to the letter query were Senator Richard B. Russell (D., Ga.), Senator Robert A. Taft (R., Ohio), Senator Estes Kefauver (D., Tenn.), General Douglas A. MacArthur, and Harold E. Stassen, University of Pennsylvania. Pressure of campaigns undoubtedly prevented most of them from completing this task.

AGSTONE

SPECIFICATIONS FOR LIMING MATERIALS

Agricultural limestone should be bought and sold upon basis of effective neutralizing value. Rigid specifications for fineness and analysis not the only requirements

By F. G. MERKLE*

THE PRACTICE of laying down definite specifications with reference to the minimum purity, minimum calcium, magnesium oxides, and the minimum percentage passing a certain mesh sieve for liming materials may render an injustice to certain dealers and buyers. Both the dealer and the buyer should be interested in that product which furnishes effective neutralizing oxides at the cheapest rate on the soil.

A product may be below 50 percent CaO, and yet be a better buy than one containing over 50 percent CaO, provided the cost per ton is correspondingly low. Likewise one product may be very fine, and another a little coarser, and yet because of the price difference the coarse one would be the better buy. Obviously, to use this principle in the buying and selling of lime products, we must have a definition of the term "effective neutralizing oxides," and a clear-cut idea of the purpose for which the farmer is using the product.

Purpose of Liming

Claims have been made that the chief purpose of liming is to supply readily available calcium and magnesium to those crops which remove large amounts of these elements when grown on soils containing small amounts. However, even the most acid soils generally contain much more readily replaceable calcium than any crops remove. Furthermore, treating acid soils with gypsum (calcium sulfate) which is more soluble than calcium carbonate does not make it possible to grow lime-loving plants on acid soils. Also, neutralizing the acidity with magnesium carbonate, sodium carbonate, or potassium carbonate corrects the condition even though, in the process, no calcium is added.

The evidence is strong that the chief purpose of liming soils is to correct soil acidity and that the addition of nutrient elements is secondary. Along with this correction of acidity in mineral soils, there will be a diminution in the amounts of soluble aluminum, manganese, and possibly iron and an increase in the solubility of phosphates. Soils which contain less than 400 lb. of replaceable calcium are uncommon; however, there are areas containing less than 50 lb. of replaceable magnesium. Such soils may be benefited by magnesium containing lime products. In this case the magnesium in the lime product has a value in addition to its neutralizing value.

If the chief purpose of liming soils is to correct soil acidity, and all those conditions which accompany acidity, then liming products should be evaluated primarily upon their capacity to perform this function. This is proportional to their content of *effective neutralizing oxides.*

Effective Neutralizing Oxides

This term cannot be defined in a clear-cut manner for several reasons. In the first place a pound of magnesium oxide will neutralize 1.4 times as much acidity as a pound of calcium oxide. It would be simple to multiply the MgO by 1.4 and add that to the CaO, calling the total the "CaO equivalent." But dolomitic limestones (those containing appreciable $MgCO_3$) are much less soluble in water, weak or strong acids, than calcitic limestone. Hence, the presence of $MgCO_3$ increases the total neutralizing value but decreases the rate of reaction with soils. This slowness of reaction of dolomitic products is very marked, especially in coarsely ground products. One must use a much larger amount of dolomitic material per acre to effect the same neutralization and crop production as would be produced by a smaller amount of calcitic product. Hence, the greater neutralizing power of the Mg in dolomitic liming materials is more than counterbalanced by the much slower reaction.

Fineness of grinding is the other factor which influences the effective neutralizing capacity of a limestone. Limestone is not very soluble in water; it is more soluble in soil water. The reaction between limestone and an acid soil consists of a slow dissolving of calcium bicarbonate from the surface of the limestone particles and its reaction with the replaceable hydrogen on the soil particles. This being a surface reaction, the greater the surface the faster the neutralization.

The hydrates of calcium and magnesium are the fastest reacting forms of lime because of their extreme fineness and disruption of crystals in the burning process. All experiments on rate of reaction and effectiveness in producing lime-loving crops on acid soils show that hydrates are most effective. They may be taken as the acme of perfection.

However, for nearly all purposes it may be assumed that calcitic and dolomitic limestone separates, 100 mesh and finer, are practically equal to the corresponding hydrates when used in *equivalent* amounts. By equivalent amounts we mean equal total neutralizing value, i.e., percent CaO plus (MgO times 1.4). Thus for calcitic and dolomitic limestones ground finer than 100 mesh, we may consider the effective neutralizing value to be equal to the percent CaO plus the (percent MgO times 1.4).

However, this is not so with material that is coarser than 100 mesh. The rate of reaction and hence the effectiveness of dolomitic limestone separates falls off rapidly as the material becomes coarser. Its effectiveness decreases much more than that of calcitic stone of equal size. Calcitic stone, 60-80 mesh, is much more effective in raising the pH value, decreasing the replaceable hydrogen, aluminum and manganese, and in promoting growth than is dolomitic limestone of the same size.

For these reasons the magnesium present in pulverized stone, which is coarser than 100 mesh, should not be credited with its extra neutralizing value. That is, the MgO should not be multiplied by 1.4. In this manner the greater neutralizing power of Mg and its possible nutrient value is counterbalanced with its slower rate of reaction and longer residual influence. The importance of speed of reaction in our present economy is evident.

With the above facts in mind it seems fair to give to 60- to 100-mesh material a value of 60 percent of that of hydrate or of 100-mesh stone. The oxides of Mg and Ca are added together without using the factor 1.4 for MgO.

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In evaluating material 20-60 mesh in size the same principles hold as for 60- to 100-mesh material, except that the 20- to 60-mesh separate should be given a value of 20 percent of that of the 100-mesh separate.

Material coarser than 20 mesh, no matter what its purity may be, should be given no value. The amount required to do the job is so great and its rate of reaction so slow that whatever benefit it may have is absorbed by the cost of freight, cartage and application. Experiments which we have conducted have shown that 45 tons, i.e., 12 times the lime requirement of 10- to 20-mesh calcitic stone or of dolomitic stone, were not equal to 3.7 tons or once the lime requirement of 100-mesh material.

Summarizing the above conclusions it would seem that rigid specifications as to what constitutes agricultural limestone with reference to fineness and analysis should not be made. Instead limestone should be bought and sold upon the basis of its *effective neutralizing value*. This value embodies its analysis for Ca and Mg oxides, its fineness and the possible nutrient value of the Mg contained.

That product which furnishes, delivered on the farm, *effective neutralizing oxides* the cheapest per pound, is the product to buy. The effective neutralizing oxides may be calculated from a chemical analysis and a screen test. This analysis should show the percent of CaO and MgO and the percent passing a 100-mesh screen, the percent between 60 and 100 mesh, the percent 20-60 mesh and finally the percent coarser than 20 mesh. The cost should be that delivered on the farm.

This leaves one decision up to the buyer, namely, does he require a magnesium-containing product to bolster up a magnesium deficient soil? If so he can choose one having an MgO content of 10 percent or more. The calculation of its comparative value would be the same as for any other product.

Calculation of Comparative Value

Calculation of the cost per unit of effective oxides is best illustrated by an example. Product A has the following analysis and screen test. Delivered cost is $6.50.

Note that the material finer than 100 mesh is given 100 percent for its physical effectiveness and its MgO content is given a CaO equivalent of 1.4.

For any given season the cost per unit of effective CaO equivalents may be determined on as many products as there are quotations and analyses. The product providing effective CaO equivalents the cheapest per unit would be the one to choose.

Analysis		Screen test	
CaO	29 percent	Coarser than 20 mesh	8 percent
MgO	21 percent	20-60 mesh	12 percent
		60-100 mesh	30 percent
		Finer than 100 mesh	50 percent

Cost per unit of effective oxides:

Screen	Percent	Effective CaO, percent	Units of effective CaO eq.
Over 8 mesh	8	0	0
20-60 mesh	12	20% of 50 = 10	1.2
60-100 mesh	30	60% of 50 = 30	9.0
Under 100 mesh	50	100% of 58.4 = 58.4	29.2
			39.4

39.4 units effective CaO equivalent at $6.50 = 16½ cents per unit of effective CaO equivalent.

AGSTONE

REQUIREMENTS FOR GOOD LIMING MATERIALS

Wisconsin agstone law summarized. Farmers find that extra cost for fine-ground material is not always justified

By C. J. CHAPMAN*

THE QUESTION of what kind of lime to use must be answered to a considerable extent by the farmer himself. Such factors as the delivered cost on the farm, moisture content, calcium carbonate equivalent or test, fineness of grinding, and cost of spreading are items which the farmer must consider before determining which form of lime is cheapest or most advantageous for him to purchase. The cost per acre per year to maintain an adequate lime supply in the soil is, after all, the main consideration.

Many different kinds of liming materials may be used. The most important kinds in Wisconsin are pulverized limestone, marl, papermill sludge, beet sugar factory waste, air slaked lime, commercial lime hydrate, mine tailings, and wood ashes. There are adequate supplies of some one or more of these kinds of lime in all but five or six counties in the state of Wisconsin. In counties where natural deposits occur or where papermill sludge or beet sugar factory waste is available, these local liming materials are usually the cheapest. There is no economy in paying freight on lime shipped long distances where good supplies of pulverized limestone are available in the county.

In buying pulverized limestone, reasonable fineness is important. Most commercial companies and many local operators are now doing a good job of grinding. Limestone pulverized to a fineness so that 50 percent of the material will pass a 60-mesh screen is a satisfactory product. Failure to get results has been due in some instances to the use of a very coarse product.

Wisconsin Agstone Law

The Wisconsin legislature in 1945 passed a law regulating the sale and distribution of agricultural limestone. This law became effective January 1, 1946. Here is a summary of this law.

Material covered by the law. Ground, crushed, or pulverized limestone used for liming soils. The finer material can not be removed. All other material

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An important factor in "making sure" with alfalfa has been the 24,000,000 tons of liming materials applied to Wisconsin's acid soils during the past 18 years. Wisconsin farmers are now growing more than 2,000,000 acres of this "deluxe member" of the legume family. Here is a comparison of a field that had lime applied on only part of it. The entire field was given a light dressing with "phosphated manure" at the time of seeding; lime was used on that part at right.

like hydrated or quicklime, marl, industrial by-product, mine tailings, and limestone screenings are exempt.

Registration and fee. A license, the fee of which is $10 per year or fraction thereof, must be obtained by any person selling or distributing agricultural limestone in Wisconsin. No license needs to be obtained by a person selling or distributing a product produced by another already licensed.

Grades established. (1) "Grade A agricultural lime" designates a product of which at least 90 percent passes a standard 8-mesh sieve and either at least 50 percent passes a standard 60-mesh sieve or at least 30 percent passes a standard 100-mesh sieve. The minimum neutralizing value is 85 percent on an oven-dry basis. (2) "Standard grade agricultural lime" designates a product of which at least 80 percent passes a standard 8-mesh sieve and either at least 35 percent passes a standard 60-mesh sieve or at least 20 percent passes a standard 100-mesh sieve. The minimum neutralizing value is 80 percent on an oven-dry basis. Expressed decimally, the product of the amount passing the 8-mesh sieve multiplied by the neutralizing value must equal or exceed 0.72. (3) "Substandard grade agricultural lime" designates a product which does not meet the minimum specifications of "standard grade agricultural lime."

Statement to purchaser. On final delivery of a lot or order, the purchaser is to be furnished a written statement showing amount delivered in tons and the grade of it. The moisture basis for weight purposes is a maximum of 8 percent. Scale weight basis may be used. Agricultural limestone not sold on a scale weight basis is sold on the assumption that agstone occupies 20 cu. ft. per ton. The actual analysis may also be given.

Distributors' requirement. Each vehicle transporting agricultural limestone not sold on a scale weight basis is to be plainly marked to show ton weight capacity when level full assuming 20 cu. ft. per ton.

A written statement setting forth the grade of the agstone being transported shall accompany each vehicle when making delivery.

Other requirements. Provision is made in the law for inspectional work, revocation of license and penalty for violation.

Fine Grinding Necessary?

The hammermill type of pulverizer if kept in proper adjustment will produce a satisfactory product. Where extreme fineness is desired, it is necessary to use special types of pulverizing equipment, which greatly increases the cost of the product. There are few situations in Wisconsin where farmers can justify paying considerably more for the extremely finely pulverized material. It is true that more of the lime in the very fine material acts immediately; however, when 50 percent passes a 60-mesh screen, there is enough fine material present to give immediate action and results where applied at recommended rates.

Over a period of years, farmers will find that ordinary grades of pulverized limestone are cheapest. So far as immediate results are concerned, it must be recognized that in the application of, say, three tons per acre of the ordinary pulverized limestone (50 percent passing a 60-mesh screen), one is actually putting on just as much fine material in these three tons as is contained in one ton of the so-called "super-fine" products, and of course, the 50-, 40-, 30-, 20-, 10- and 8-mesh material included with the fine material will become available in the years that follow.

Misleading statements have appeared in the advertising literature of some of the commercial companies relative to the moisture content of ordinary pulverized limestone. The undried pulverized limestone products which are being produced in local county quarries, or being shipped by freight from commercial companies, usually contain less than 5 percent of moisture and in most instances will run only 1½ to 2 percent of moisture.

Practically all of the limestones in Wisconsin are dolomitic; that is, they contain both magnesium and calcium carbonate. The claim that certain commercial finely pulverized forms of limestone are superior to the ordinary grades of limestone from the standpoint of magnesium content is not true. If there is any merit in the claims made that limestone containing magnesium is superior, then practically all of the agricultural limestones of Wisconsin have this advantage.

In Illinois Circular No. 375 entitled "Limestone," the author, C. M. Lindsay, speaking of the degree of fineness and economy in the use of agricultural limestone, says:

"Material which will pass through this size of screen (8 mesh) contains a sufficiently large proportion of fine dust to correct the acidity of soils rapidly enough for all practical purposes. The advantage of extra fine grinding is not enough to justify paying a much higher price for it."

In Ohio Bulletin No. 177 entitled "Liming Ohio Soils," the author, Earl Jones, says:

"Fine grinding increases the cost of production, and therefore the price to the farmer. Experimental evidence indicates that the use of materials finer than agricultural limestone (40 to 60 percent passing a 100-mesh screen) is seldom justified at present prices."

Special Bulletin No. 107, University of Minnesota, by F. J. Alway, makes this statement:

"The finer the limestone the higher is the cost of grinding and beyond a certain degree of fineness the increased effectiveness does not justify the increased expense."

Claims made for the fertilizing value of certain impurities in agricultural limestone do have some merit—certain of the dolomitic limestones in Wisconsin contain appreciable amounts of phosphorus. For instance the Galena formation (Ordovician) carries up to 0.3 percent P_2O_5 whereas the Niagara limestones (Silurian) of eastern Wisconsin will average not more than 0.02 percent P_2O_5. The content of other impurities may or may not be of significance. No studies have been made to confirm or disprove claims for or against.

EVALUATING NEUTRALIZING POWER

By FIRMAN E. BEAR*

WHEN ONE LOOKS back over the history of the agricultural limestone industry he is impressed with the need to look forward instead. A lot of old concepts have had to be abandoned. There is still a need to know a lot more about fineness, neutralizing values, rate of disappearance of applied limestone from the soil, and the pH values that should be maintained in the soil.

In an effort to arrive at some orderly thinking on the subject, soil specialists from New York, Pennsylvania, Ohio, New Jersey and Maryland, after five years of study and annual conferences, jointly published a bulletin on "One Hundred Questions and Answers on Liming the Land." This bulletin has enjoyed a wide readership. But there are a good many questions about liming the land to which these specialists did not have the answers. And some of the answers in the bulletin will certainly have to be changed in time.

The one fact that should be kept in mind is that acid soils need liming. If they are not limed, a lot of time and money is wasted in trying to grow high acre yields of crops on them, and the quality of the crops that are grown leaves much to be desired. The need for liming the land grows with each succeeding generation, as heavier applications of fertilizers are made and greater effort is put into producing more per acre.

All the chemist *needs* to know about any agricultural limestone product that is being offered for sale is its fineness, as measured by 10-, 50-, and 100-mesh screens, and its content of the carbonate forms of calcium and magnesium. He might *want* to know some other facts, such as its hardness, its porosity and its content of certain important trace elements. But there is little in the evidence to date to indicate with any certainty that extra value can be attached to these subsidiary qualities.

Yet from a knowledge of the screen test and the content of calcium and magnesium in carbonate form, men often reach very different conclusions as to relative merits of the several limestone products. It seems improbable that these differences of opinion will ever be reconciled. The essential point is that the user have the specifications at hand so that, after he has considered the various opinions, he can draw his own conclusions.

*Chairman, Department of Soils, Rutgers University, New Brunswick, N.J.

Evaluating Neutralizing Power

One of the most controversial points about agricultural limestones is how one is to evaluate their neutralizing powers. In the laboratory, it is known to be a fact that a unit of magnesium carbonate has a higher neutralizing value than a unit of calcium carbonate. But in the field, we have to take into consideration that some soils have high fixing powers for magnesium, and this raises considerable doubt as to whether this extra neutralizing value can be realized in agricultural practice.

It is highly important that the user know how much magnesium in carbonate form the product contains. As to whether the percentage is expressed as the element or the oxide makes little difference. The essential point is that, if his soil is deficient in magnesium, he can select a product that supplies this element in adequate amount.

We are certain also that it is highly important to know the fineness of the limestone product, especially if it is derived from dolomitic stone. The high degree of insolubility of dolomitic types of limestone requires that special attention be paid to pulverizing them to a relatively fine state. In other words, one can get better results from coarse calcitic stone than he can from coarse dolomite.

As to impurities in limestone, it is the author's impression that they seldom are of sufficient value to compensate for the loss in neutralizing value in the product. In other words, one buys agricultural limestone because he wants to use it to destroy the acids in his soil. He may also be interested in calcium and magnesium per se, but he has little interest in the small amounts of one or more trace elements of uncertain quantity, degree of availability, and plant value that may be present in the stone.

AGSTONE

CHEMICAL FUNCTIONS OF AGSTONE

By S. A. BARBER†

FARMERS OF INDIANA apply approximately 2,500,000 tons of agricultural limestone each year. It is usually obtained from local quarries and is spread on the field by lime spreader trucks. It is used to replace the hydrogen present on the soil colloids of soils having a low pH. The replacement of hydrogen with calcium and magnesium of the limestone raises the pH level of the soil, supplies calcium and magnesium and provides a more satisfactory environment for the plant root. The ability of a particular limestone to do these things depends upon its physical and chemical nature.

The rate at which limestone reacts with the soil is determined by the fineness to which it has been pulverized. Fine limestone particles become more intimately mixed with the soil and dissolve more rapidly. Particles which are larger than 4 mesh are so large that they dissolve slowly and are of little value as liming material. Particles between 4 mesh and 20 mesh react slowly and while they do not give an immediate supply of calcium and magnesium to the soil, they are useful in that they supply them continuously over a period of many years. Particles finer than 100 mesh are small enough that they dissolve and react with the soil within six months.

When the soil is very acid, below 5.7, it is usually desirable to correct

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the acidity as rapidly as possible. This makes it necessary to use a liming material containing a large amount of fine material. Where the soil is already at a pH of 6.0 or greater, an application of limestone which has a large proportion in the 20- to 60-mesh size range will increase the pH and maintain the increase over a period of 6-8 years.

After the limestone has gone into solution and reacted with the hydrogen on the clay, the calcium and magnesium are held by the clay in a form available to the plant and are not subject to serious loss by leaching.

The chemical quality of a limestone is measured in terms of the $CaCO_3$ equivalent. This measures its ability to neutralize the soil acid when all of the material reacts with the soil. Limestone containing clay or other impurities will have a reduced neutralizing value.

Both calcitic and dolomitic types of limestone are produced in Indiana. The dolomitic stone has varying proportions of magnesium. Up to the present, there is no direct evidence in Indiana to indicate an advantage of one over the other. However, where calcitic stone alone is used for many decades there will likely be a danger of magnesium deficiency eventually occurring. Fortunately a large portion of the liming materials in Indiana are dolomitic so that by using it part of the time no magnesium deficiency is likely to occur. Limestone contains small amounts of minor elements and sometimes phosphorus. These are of little consequence in Indiana because the amounts are small and they are found in compounds which are not readily available to the plant.

Minimum Standards

Minimum standards for limestone sold in Indiana are those required to meet P.M.A. specifications. They are: (1) any limestone containing all of the finer particles obtained in the grinding process and crushed sufficiently fine that 96 percent passes a 4-mesh sieve. (2) In addition the fraction through an 8-mesh multiplied by the neutralizing value must equal or exceed 0.72.

These specifications may be met by limestone which has a wide range of very fine material. A sieve analysis of 234 samples of limestone taken in 1951 gave the following average and extremes in particle size distribution:

	Percent passing, meshes to the in.				
	4	8	20	60	100
Average	99	88	59	30	21
Extremes (quarry averages)					
Finest	100	92	71	45	36
Coarsest	96	77	41	18	11

There is a need in Indiana for a grade of limestone which is finely ground (such as one having a minimum of 50 percent through a 60-mesh sieve). This would be used in areas where a rapid neutralization of soil acidity is required and there the distance from the quarry makes it inadvisable to use heavier rates of a coarser material because of the higher cost. There is also a need for a minimum on the percent of fine material present in the regular grade of limestone (such as 30 percent through a 60-mesh sieve). This would discourage the production of very coarse materials.

There is some interest in having a lime law in Indiana to enforce the various grades of limestone. There are also other groups who feel that the same result could be obtained by an educational program to the farmer, the cooperation of P.M.A. and the cooperation of limestone producers. The application of the latter proposal appears to be the simpler solution to the problem.

At the present time much of the limestone produced in Indiana is of satisfactory fineness for maintenance liming purposes. It is where the soils are acid and a rapid reaction is needed that it is necessary to increase the proportion of fine material in the limestone.

AGSTONE

VALUABLE TRACE ELEMENTS IN AGSTONE

By S. C. JONES*

MOST OF KENTUCKY and much of the adjacent territory in this area has an abundance of high quality limestone, which is widely distributed. It is being developed for use in building and maintaining roads, railroads, ballast for all kinds of construction work and, of course, agricultural limestone for the soil as well as various other purposes.

The limestone industry development in this area ranges from many small local quarries to large industrial quarries. This means that agricultural lime is being made available for most farmers over a large part of the area, with short range hauls.

Much of the agstone produced in this area is virtually by-product material and for this reason, along with the short haul required for most farmers, is delivered and in many instances spread on the land at comparatively low cost.

Marl, a natural liming material, is also found in this area, especially in Kentucky. It exists in greater or lesser quantities in some 70 Kentucky counties and in considerable quantities in almost half of them. Most of it is of low grade, ranging in neutralizing value from 35 to 50 percent—some of it, however, ranging on up to 85 percent or more.

Because of the abundance and low cost of agricultural limestone available in Kentucky, it has not been considered wise to advocate laws regulating the physical and chemical qualities of agstone to be used in the state. We have, however, advocated the use of higher analyses and finer ground limestone, especially where the distance to be transported would justify the higher cost of such materials.

P.M.A. Specifications

The United States Department of Agriculture, Production and Marketing Administration, does have specifications regulating the use of liming materials in their grant of aid to farmers in carrying out their agricultural conservation program in Kentucky. The following quotation is from their handbook for 1952:

"Standard ground limestone shall contain calcium and magnesium carbonates equivalent to not less than 80 percent calcium carbonate and must be fine enough so that not less than 80 percent shall pass through a 10-mesh sieve, provided that either the calcium carbonate equivalent or the proportion of material passing through a 10-mesh sieve, or both, be sufficiently greater than 80 percent so that the product of the multiplication of calcium carbonate equivalent by percent of material passing through a 10-mesh sieve shall be not less than 0.72. All the finer particles obtained in the production process shall be included. Ground limestone not meeting the above specifications will be considered as limestone screenings. For the purpose of this practice, each of the following will be considered to be

(Continued on page 130)

*Soils technologist, College of Agriculture and Home Economics, University of Kentucky, Lexington, Ky.

IOWA AGSTONE PRODUCERS DISCUSS SALES AND GOVERNMENT CONTROLS

IOWA AGRICULTURAL LIMESTONE ASSOCIATION, long active in a big agricultural limestone producing state, held its 7th annual convention March 5 and 6, at the Savery hotel in Des Moines. It was a well-attended convention, the total registration passing the 200 mark. Principal business of the association was transacted, officers were elected, a report on the first annual convention of the National Agricultural Limestone Institute was presented, and talks given on merchandising, percentage depletion and the PMA program.

Floyd H. Millen, Valley Limestone & Gravel, Inc., Farmington, was elected president of the association. E. H. Matthias, Waterloo Dredging Co., Waterloo, is the new vice-president, and two new directors are Robert H. Schneckloth, Lowden Rock Products, Lowden, and Wood W. Weaver, Weaver Construction Co., Iowa Falls.

The retiring president, C. M. Kirtley, Missouri Valley Limestone Co., Des Moines, welcomed the members at the opening session. He commented briefly on the purpose of the association and the value of both state and national associations. Also, he said, the merger of the two former national groups into one will now channel efforts toward a common goal, with no more division of interests.

Clint A. Allen, executive secretary, followed with a report of his activities in the past year. He drove 5000 miles during the year, calling on as many producers as possible. The board of directors, he reported, met seven times during the year. Mr. Allen lauded the spirit of the directors, who perform excellent service and yet serve without pay, he said. The outdoor billboard campaign, which will run until October of this year, was stated by Mr. Allen to be very successful. This year 28 sets of posters have been made up, each set consisting of a series of six different posters. Three other states, Wisconsin, Illinois and Tennessee, are making use of the Iowa-developed posters, Mr. Allen said. Since the program was described in considerable detail at the National Agricultural Limestone Institute convention in January by Mr. Millen, many inquiries have been received in Mr. Allen's office (see ROCK PRODUCTS, February, 1952, pages 91-92).

National Association Activities

The new N.A.L.I., its purposes, its first annual meeting and comments on the industry in general were covered in an impromptu talk by Robert M. Patton, new president of the merged national associations. He was introduced by K. K. Kinsey, Cedar Rapids, first vice-president of N.A.L.I. Mr. Patton again told the differences between the former Agricultural Limestone Institute, which directed its efforts to promotion and merchandising, and the National Agricultural Limestone Association, which devoted itself primarily to legislation. Now the one association has both these necessary goals, he said. Producers must promote and educate to sell the product, he continued. The industry is young, so it must have help in the form of government subsidies.

Mr. Patton believes that state associations should be very strong. As they develop strength, he envisions the time when the national body will become the coordinating group, a step which will be better organizationally. He feels that the country's agstone producers are one-third of the way to the potential annual sales of 80,000,000 tons of agstone, and there is no reason why that potential can't be reached.

The agricultural liming program Congressional appropriation for 1953 was kept at $256,000,000 by a slim vote, 38-37. The national association had a strong influence in this favorable result, Mr. Patton said, but it is a warning. When the subsidy is cut or dropped, as he believes it will be sometime, the industry must be in a strong position. That is the goal toward which the N.A.L.I. is working.

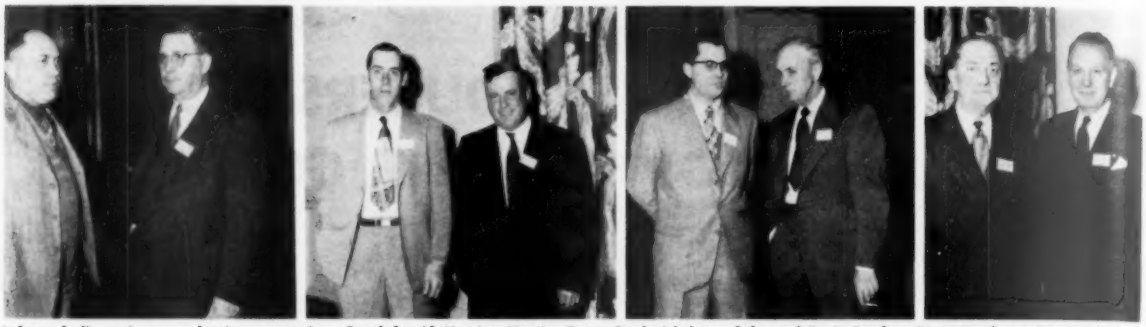
Percentage depletion was one of the principal topics discussed at the first annual meeting of the national group, according to Mr. Patton. Testimony by association members and the national executive secretary, Robert M. Koch, had great influence on inclusion of the industry in percentage depletion benefits, he said. This subject is vital to anyone figuring on making a profit. Other profit-aiding national activities of the association are the promotional booklets put out for producers to distribute. More time and money are now being spent on promotional material. A number of movies are to be prepared showing the effects of liming.

In closing, Mr. Patton lauded Mr. Allen for his assistance in obtaining O.P.S. decontrol of agstone trucking. The reversal of an order stopping decontrol has itself been reversed, so as of March 4, controls no longer applied to the trucking.

Business Meeting

Among the state association business transacted was the passing of a resolution to the state P.M.A. office

New officers of the Iowa Agricutural Limestone Association are, l. to r., R. H. Schneckloth, Lowden Rock Products, Lowden, director; E. H. Matthias, Waterloo Dredging Co., Waterloo, vice-president; Floyd H. Millen, Valley Limestone & Gravel, Inc., Farmington, president; and Wood W. Weaver, Weaver Construction Co., Iowa Falls, director



Informal discussions at the Iowa meeting. Far left: Al Hewitt, Hewitt Bros., Fredericksburg, left, and P. A. Dooley, River Products Co., Iowa City. Left center: Ralph Payne, left, and John D. Akin, both with Aurora Limestone Products, Aurora. Right center: Ray E. Binns, Kisor-Binns Explosives Co., Oskaloosa, left, and Lee R. Paige, Beu & Sons Co., Grundy Center. Far right: C. M. Kirtley, Missouri Valley Limestone Co., Des Moines, retiring president of the association, left, with Prof. Tom Hippaka, Iowa State College, Ames, who was one of the speakers

requesting its aid in asking the Department of Agriculture to change the present calendar year basis of the P.M.A. program to a fiscal year basis. Many producers would prefer that arrangement since the bulk of the agstone is spread during December and January, and very little is spread after May 1.

Mr. Kirtley, during the business meeting, commented that he doesn't enjoy being in a business which depends upon a government subsidy. Every producer, he said, should promote agstone on its own merits, though he admitted the government program certainly has helped sales. However, this is not a healthy way to build a business. If producers want to be able to predict business trends with some degree of accuracy, and also to have a firm foundation of sales, the government should not be depended upon, Mr. Kirtley said. With all due respect to our form of government, he pointed out, politics nonetheless makes any program unpredictable.

In the discussion following, it was suggested that the Iowa association have an operating session during the next annual meeting, similar to the one held at the national meeting. This would give producers an opportunity to discuss common production problems and to work out solutions. The suggestion was favorably received and will be studied.

The morning session ended with a talk by Prof. Tom Hippaka, Iowa State College, Ames, whose subject was "Democracy is Never a Gift."

How to Sell Agstone

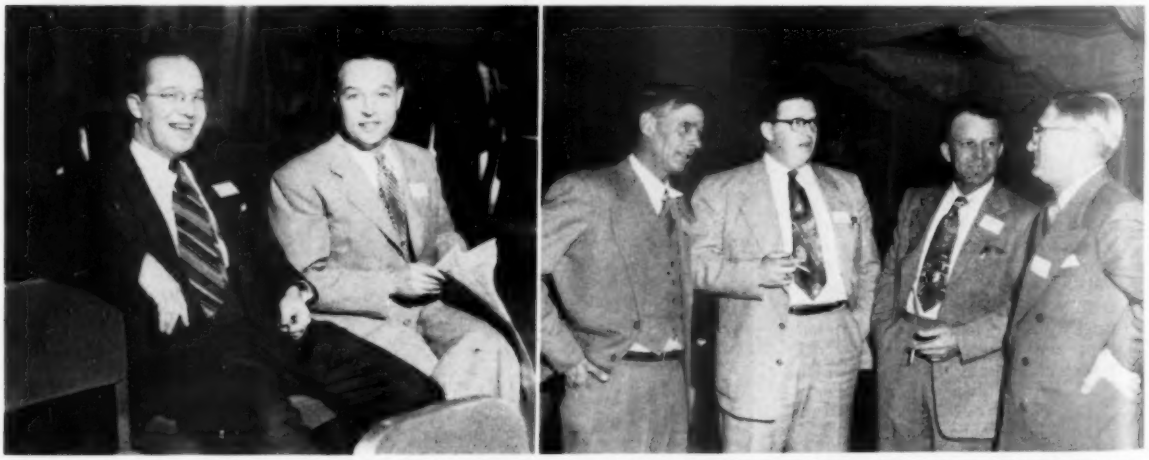
The afternoon session was opened with a talk by Don Ross, merchandising manager, *Successful Farming*, on ways to promote agstone sales. He suggested that producers make friends with the local newspaper publisher, who can help publicize the value of liming. Furthermore, many new farmers don't know the producer, which is the main reason for advertising.

The population increase in this country has been accompanied by a decline in the number of farms, Mr. Ross said. Productive acres have increased 3 percent since 1940, but gone are the surpluses of food. Many people have underrated the farmer and his desire to better himself and his production record. As an example the speaker pointed to the Rural Electrification Administration's error in not expecting a heavy demand for electricity. The midwest farmer's average income is $10,000, Mr. Ross reported, of which half goes back into the farm to increase production. Nonetheless, farmers will not beat down producers' doors for agstone. It is necessary to go to the farmer, for every one is in competition for his dollar.

Percentage Depletion

A very lucid explanation of the new percentage depletion benefits voted to crushed stone producers was given by Sidney Smith of James C. Addison Co., Des Moines. He also presented the historical background of our taxes and how they have followed a developmental pattern. Our present basic tax law dates back to 1913, when the revenue act setting up the income tax was voted. The amount taken from taxpayers has steadily increased, and the law has kept pace by becoming more complicated. Concessions have had to be adopted in the law.

(Continued on page 156)



Left: Robert M. Koch, executive secretary, N.A.L.I., Washington, D.C., left, and Robert M. Patton, president of N.A.L.I., New York Coal Sales Co., Columbus, Ohio, were glad they could get to the Iowa meeting. Right: A controversial point is discussed by, l. to r., W. P. Irelan, Grand River Limestone Co., Grand River, Iowa; Phil Pasco, Sargent Bros., Inc., Des Moines, Iowa; S. B. Stuck, Grand River Limestone Co.; and Ernest I. Sargent, Sargent Bros., Inc.

COMBINATION STATIONARY AND PORTABLE PLANT

New-type haulage units speed up delivery to plant at Pacific Coast Aggregates' operation at Centerville, Calif.

By WALTER B. LENHART

THE CENTERVILLE, CALIF., plant (No. 106) of Pacific Coast Aggregates, Inc., has in use a new type of haulage unit named the "Cobra Wagon," that is manufactured by Wooldridge Manufacturing Co. This unit hauls a 25-ton payload, and has a distinctive method of unloading. The truck consists of a low-slung flat bed over which are mounted the sides and ends. This bottomless section slides longitudinally on the flat bed and is moved by steel cables and a cab-mounted winch. The loaded wagon is emptied by pulling the bottomless section towards the rear of the unit, which at the same

Quayle Collinson, left, superintendent at Centerville, and J. C. Paulo, assistant superintendent

time pushes the load off of the flat-bottomed section. It can either dump in one spot or spread the load. The unit is powered by a 200-hp. supercharged (blower) Cummins diesel.

In the May, 1949, issue of ROCK PRODUCTS, page 92, the Centerville operation was described. The plant is a combination of a stationary section and portables. Flat lenses of clay in the deposit have always been a problem and occasionally some hand sorting has been done. Another scheme tried was to pile the clay aside and let it dry so that it would disintegrate readily. During March, 1950, the company installed a 66-in. x 10-ft. Hardinge scrubber that has a double-jacketed screen barrel using ½-in. punched plate for the inner drum and ¼-in. wire cloth on the outer section. The throughs from the outer screen flowed to the older 48-in. Wemco sand machine.

The Cobra wagons unload to a 5¾-in. grizzly at the plant. There is little gravel larger than the grizzly spacing and much of it is in the minus 4-in. range. This is a disadvantage in the scrubber for when large pieces of clay get into the plant it is desirable to have larger gravel in the scrubber drum to break up the sticky clay. It takes about 1¾ min. for a large chunk of material to go through the scrubber.

Since the scrubber was put into use, heavy 6-in. high angle iron lifters have been installed in the unit. These are spaced on about 15-in. centers and are hard surfaced before installation. The scrubber is driven by a 200-hp. motor.

At the time of inspection two Allis-Chalmers Model 322 type "R" reduction crushers were being installed along with a 4- x 12-ft. Tyler vibrating screen. The 1½- to 2½-in. gravel is to go to the new crushers and the plus 2½-in. to the older Diamond Iron Works portables. Crushed gravel is kept separate from uncrushed, and road stone is an important product at this operation.

The pit uses a Bucyrus-Erie 38-B dragline with a 2-cu. yd. McCaffery bucket. The bucket was originally of 1½-cu. yd. capacity but has been rebuilt to hold the larger amount. At the grizzly serving the plant there is a stockpile of pit-run material. When the pit is not in operation the stocked gravel and sand can be pushed to the grizzly by the Caterpillar tractor.

Quayle Collinson is superintendent at Centerville and J. C. Paulo is assistant superintendent. R. K. Humphries is general manager of Pacific Coast Aggregates, with offices in San Francisco.

Left: Loading new type wagons in the pit of Pacific Coast Aggregates, Inc., Centerville, Calif., plant. Below: The body of the truck is moved backward and, in so doing, scrapes off the material and dumps it on to the grizzly

CEMENT, LIME AND GYPSUM PAPERS DOMINATE A.I.M.E. MEETING

Numerous papers on nonmetallic minerals divulge wealth of engineering and operating data

By OLIVER BOWLES*

THE 173RD GENERAL MEETING of the American Institute of Mining and Metallurgical Engineers, held in New York City, February 17-21, 1952, was attended by over 2500 representatives of mining companies, government bureaus, state geological surveys, educators, research scientists, consultants, press representatives, equipment manufacturers, and others interested in various phases of the mining and metallurgical industries. The Industrial Minerals Division, under the able leadership of Chairman A. B. Cummins, manager of research, Johns-Manville Co., presented eight sessions or joint sessions of interesting papers covering a broad range of subjects in the nonmetallic minerals field. During a luncheon session on February 19, Dr. Cummins reviewed briefly the activities and accomplishments of the division during the past year and introduced the new chairman, Dr. Ian Campbell of the California Institute of Technology, who outlined the plans of the division for the coming year. In the review of proceedings which follows, attention will be devoted chiefly to limestone, lime, cement, gypsum, furnace refractories, aggregates, asbestos and similar subjects in which readers of ROCK PRODUCTS are primarily interested.

*Consultant in mining and geology, Washington, D.C.

New Cement Plants

Several papers of primary interest to cement operators were presented. C. C. Van Zandt, chief engineer, described certain features of the design of the two new plants built by Lone Star Cement Corp., one located at Lone Star (near Roanoke, Va.), and the other at Maryneal (near Sweetwater, Texas). Both plants began operation in 1951. The capacity of each plant is 1,500,000 bbl. per year, and the total cost of each about $10,500,000. On the basis of 1951 money this would represent an investment of $7 per annual barrel.

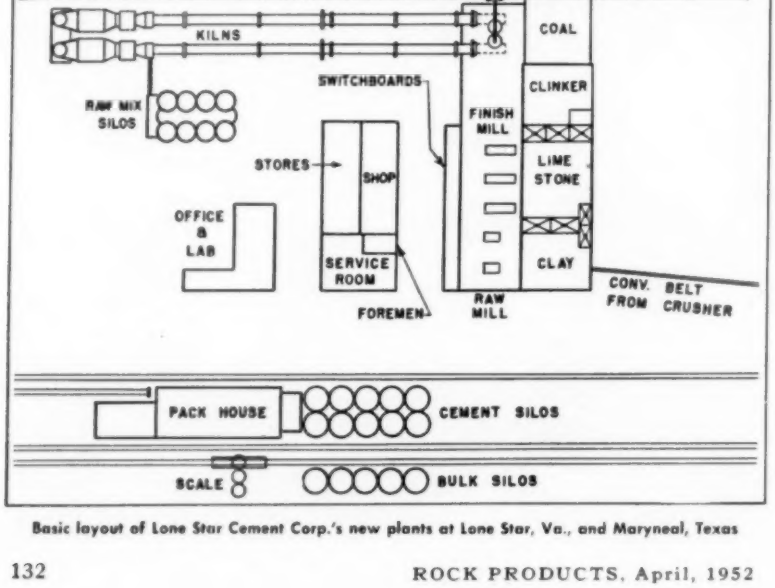
The Virginia raw materials are dense limestone and clay, and the Texas materials soft limestone and hard clay. Sand and iron oxide are added in small quantities. Both plants use the dry process because (1) the materials are easily dried, (2) substantial fuel savings can be attained, and (3) raw grinding ball and liner wear is much smaller than when the wet process is used. An additional reason at the Texas plant is the scarcity of water. The plant layout is shown in the accompanying illustrations.

A feature of special interest is the use of an Eriez metal detector which protects the secondary crusher from tramp metal, whether magnetic or nonmagnetic. Another unique feature is grinding the raw materials with ball mills in closed circuit with air separators which are supplied with hot air for drying. The clinker grinding department also has air circulation, but in this instance cold air is employed to cool the clinker. The plants are exceptionally dust free. Even when efficient dust collecting systems are used belt conveyors are sources of dust and litter. In these plants completely enclosed drag conveyors are used in place of belt conveyors. In many other respects these plants illustrate the use of the most modern types of equipment known.

The Lone Star, Va., plant was described in the August, 1951, issue of ROCK PRODUCTS and, in this paper, Mr. Van Zandt presented operating data that justified the choice of the dry process for these two plants.

Typical raw grinding operating data for the Lone Star, Va., plant, figures covering two grinding units in parallel, were as follows:

Output (monthly average)	80 net tons/hr.
Fineness	92.5 minus 200 mesh
Moisture in feed	3½ percent av., 7 percent max.
Moisture in product	Less than 0.5 percent
Power requirements	
2—9½- x 15-ft. ball mills	1000 kw.
2—16-ft. air separators	129.6 kw.
2—Separator elevators	32.8 kw.
2—Exhaust fans	48.6 kw.
2—Oil furnaces	18.2 kw.
All feeders and conveyors	41.3 kw.
	1271.5 kw.
Fuller-Kinyon System (raw mill to silos)	139.1 kw.
Kw.-hr./ton, mills only	12.5
Kw.-hr./ton, auxiliaries	3.4
	15.9 kw.-hr./ton



Basic layout of Lone Star Cement Corp.'s new plants at Lone Star, Va., and Maryneal, Texas

The Fuller-Kinyon system requires	1.74 kw.-hr./ton
Fuel oil per ton	0.865 gal.
B.t.u./ton material dried	131,000
B.t.u./bbl. equivalent cement	38,000

Typical kiln and cooler operating data for the Virginia plant:

Kiln output (monthly average)	2000 bbl. each
Coal consumption (as received)	70 lb./bbl.
Heat consumption at 13,600 B.t.u.	954,000 B.t.u.
Kiln exit gas temperature	1200-1400 deg. F.
Temperature of exit gas—cold air mixture	650 deg. F.
Kiln speed (actual)	40-50 r.p.h.
Kiln motor input (normal)	25 kw.
Coal fineness	87 percent minus 200 mesh

Typical clinker mill operating data, for three 8- x 32-ft. clinker mills operated in parallel, each closed-circuited with a 16-ft. air separator, are:

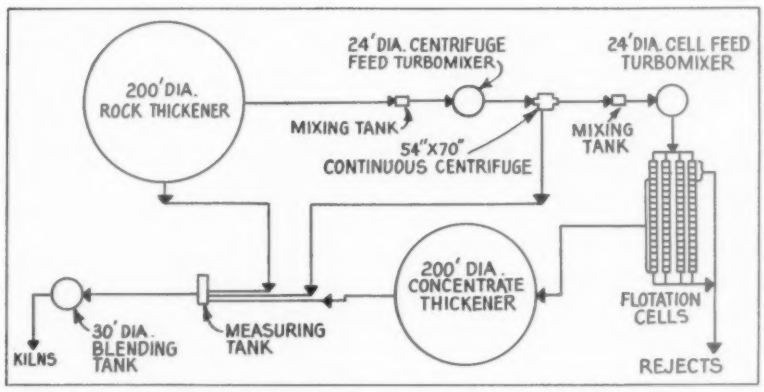
Net output/mill	112 bbl./hr.
Cement fineness	95-96 percent minus 325 mesh
Cement surface area	1750-1800 Wagner
Circulating load	about 400 percent
Mill motor input	640 kw.
Kw.-hr./bbl., mill only	5.7
Kw.-hr./bbl., auxiliaries	1.1
	6.8 kw.-hr.

The power figures do not include the Fuller-Kinyon system.

The Economy of Froth Flotation

The flotation plant of the Universal Atlas Cement Co. at Northampton, Penn., described by L. J. Boucher, plant manager, is an excellent example of the application of scientific principles to the problem of overcoming inherent deficiencies in a natural rock formation. The so-called cement rock utilized at this plant as the principal raw material in cement manufacture is so low in lime, averaging 73.2 percent $CaCO_3$, that addition of high-calcium limestone was found to be necessary to obtain a satisfactory raw material. This limestone was obtained from a quarry operated by the company at a point along the New Jersey-New York state border, 79 miles from Northampton. Before 1940, about 8 percent of total kiln feed consisted of high-lime rock. As quarrying progressed the rock became leaner in lime so that from 1940 to 1943 it became necessary to increase the percentage to 13, and if the same method were pursued in 1952 an addition of 18 percent high-calcium limestone would be required. The procurement of this supplementary material became a serious problem and, in addition, this quarry was contaminated with granite and high magnesia pockets.

The question arose even before the problem became acute: why could not the lime content of the raw mix be raised by reducing the noncalcareous content instead of adding high-lime materials? In other words, why not substitute a process of subtraction for one of addition? In 1936 an answer was sought by operating a pilot plant in which froth flotation was employed to remove part of the noncalcareous minerals from the stone. The process was perfected and has been in successful operation for a number of years. The early studies indicated that if the proportion of shipped-in rock rose slightly above 10 percent it became economically advisable to use the flotation process.



Flotation flowsheet of the Universal Atlas Cement Co. plant at Northampton, Penn.

Mr. Boucher commented briefly on the raw material used in the process and its geological formation. The mineral composition of Northampton rock is as follows:

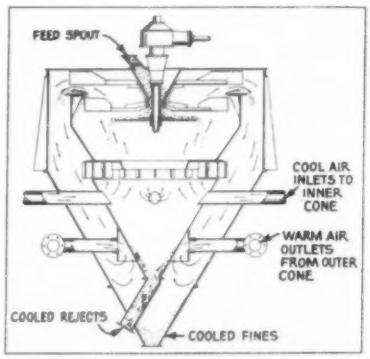
Calcite and dolomite	75.00 percent
Quartz	8.50 percent
Iron pyrites	0.56 percent
Graphitic carbon	0.50 percent
Sericite mica	15.44 percent

After crushing through a single-roll crusher and then a hammermill closed-circuited with vibrating screens, the stone is wet ground to deliver a product 90 percent through a 200-mesh screen.

The slurry, containing 25 percent solids, is dewatered in a 200-ft. thickener until the solids are raised to 54 percent. During mixing the solids content is reduced to 35 percent, and the slurry is treated in a centrifuge which separates the minus 30-micron fraction. The feed contains about 72 percent lime carbonate, the cake about 75 percent, and the effluent minus 30-micron material about 71 percent. The cake is stored for blending without further processing. The minus 30-micron material diluted to 17 percent solids is treated in four rows of flotation cells having 18 cells in each row (see flowsheet).

Flotation is complicated by the presence of the graphitic carbon in the quarry rock. This has to be removed first as it interferes with the later flotation process. Graphitic carbon is removed in the first three cells in each row, and calcium carbonate is separated from noncalcareous minerals in cells four to 18. It has been found more economical to float off the lime carbonate in the froth rather than to float the silica and other impurities. The cell feed contains 71 percent lime carbonate, and the flotation product is raised to 84 percent. The rejects amount to less than ten percent of the rock treated, and as the reject contains about 30 percent $CaCO_3$ some lime is lost in the process. The final mix ready to make Type I portland cement consists of 33 percent quarry rock blended with centrifuge cake and concentrate from the flotation cells.

Mr. Boucher covered details of control in the process to considerable extent. Flotation normally operates 24 hr. per day, five days per week and the process has proved very economical at this plant. The process was described, at the time it was new, in the December, 1942, issue of ROCK PRODUCTS, pp. 65-67.



Air separator as arranged for cooling system at the Lone Star plant is effective in cooling fresh-ground cement to 150 deg. F.

Forced Capacity Uneconomical

B. L. Jacobsen of F. L. Smidth & Co. described the performance of rotary cement kilns operating at forced capacity. As cement shortages have developed in various localities it is not uncommon to force kilns considerably beyond their rated capacities. A study was made of the economic advantages or disadvantages of

One of the 200 ft. diameter thickeners at Universal Atlas Cement Co.'s Northampton, Penn., plant

forced operations. One effect of forcing production to points 15 or 20 percent greater than that for which the kiln is designed is a great increase in dust production because the gas velocity in the kiln becomes much higher. In the plant used as an example, dust collectors were installed and the precipitated dust was returned to the kiln.

Operating at forced capacity also involves higher fuel consumption. In the case cited when kiln output was increased from 2600 to 3050 bbl. per day, the unit fuel consumption increased 26 percent. In general under excess capacity operation, labor costs will be lower per unit of production, power will remain about the same, and maintenance cost will be higher. The speaker pointed out that if forced operation is expected to last for an extended period it may be more economical to install additional kiln capacity. In discussing this paper Irving Warner claimed that in his experience the operation of lime kilns at excess capacity resulted in reduced unit costs.

Reusing Stack Dust

As cement shortages are forcing kilns beyond their rated capacities in some localities dust problems are becoming more acute. The loss of dust is so great that some companies recover it and add it to the kiln feed. P. S. Haas and Orville E. Jack of Permanente Cement Co. prepared a paper on the process they employ for reusing dust recovered in a Cottrell precipitator. The dust is too high in lime and too low in silica for a proper cement mix. Accordingly it is corrected in composition with a clay slurry and is nodulized in a rotary kiln feed. The process is described and illustrated in an article in ROCK PRODUCTS, January, 1952, pp. 164-166, to which readers who are interested are referred.

Trackless Transportation Underground

Ray W. Jenkins of the Coplay Cement Manufacturing Co. described the development and operation of an underground limestone mine at Coplay, Penn. The open quarry first worked dates back to the early days of cement manufacture. The upper beds of cement rock were satisfactory for many years, but with revision of specifications for cement the addition of high-calcium limestone to the cement rock became necessary. It was found that a crystalline limestone was present beneath the cement rock, and in 1944 drift mining of this rock was begun. It is a relatively small operation requiring only 300 tons of rock a day. The headings are 12 ft. wide and 24 ft. high. Dolomite zones are left in pillars wherever possible. Cross cuts are spaced as needed for access and ventilation. A noteworthy feature is trackless haulage on an inclined floor. A diesel-driven shuttle car is quite satisfactory. Exhaust gases are "scrubbed" with chemicals. The use of a high-grade diesel oil that will eliminate blue smoke is recommended. Simple hand-held CO detectors are in use.

Thermodynamics of Lime Burning

Lime as well as cement occupied an important place on the program. Irving Warner of the Warner Company pointed out some of the complexities of limestone calcination. One difficulty is the great latent heat requirement of 1378 B.t.u. per pound of lime produced by calcination of limestone. Calcination of $CaCO_3$ takes place at 1650 deg. F. in an atmosphere of 100 percent CO_2. In a normal kiln atmosphere of about 30 percent CO_2, calcination begins as low as 1500 degrees F., but when surface coatings of lime are formed on the limestone fragments the calcination temperature rises to 1650 degrees F. This is because lime is a reasonably good heat insulator, and an elevated temperature is required to drive the heat inward to reach the uncalcined interior of the stone particles. Reaction is also hindered by evolution of CO_2 and its passage through the pores of the stone. This gas must be heated to the temperature of the stone particle surfaces. The situation is aggravated by the fact that excessively high temperatures must be avoided to prevent fluxing of the lime with impurities in the stone or ash, or with the kiln lining. Such "overburning" detracts seriously from the quality of the lime.

High temperature heat that will calcine the stone is known as "high level heat," and low temperature heat that simply preheats the stone is "low level heat." The rotary kiln which is widely used for making lime is excellent for combustion and for radiant heat exchange when the temperature is high, but it is a poor mechanism for convectional heat exchange in the low temperature zone of the kiln.

Five requirements for high kiln efficiency were discussed by Mr. Warner in some detail in the January, 1952, issue of ROCK PRODUCTS, pp. 137-138. In the paper presented in New York emphasis was placed on the advantages and failings of rotary and shaft kilns in meeting these requirements. They may be summarized briefly, as follows:

1. Perfect combustion with 100 percent theoretical air brought to an end point well before the zone of incipient calcination. In this respect the rotary kiln is excellent. Shaft kilns are less efficient.

2. Regeneration and conservation of all the heat in the lime produced. This is the equivalent of high level heat. Externally fired shaft kilns may be fair in this respect, but rotary kilns are poor.

3. Saving external heat loss by radiation and convection in the part of the kiln which is below the point of incipient calcination. This means saving the loss of high level heat. Shaft kilns can be made to give excellent results in this respect, but rotary kilns are generally inefficient. Radiation losses are generally high in the calcination zone.

4. Keeping the temperature of gases at a minimum at the point of incipient calcination. Shaft kilns are perfect in this respect but rotary kilns are poor.

5. Sufficient preheating zone to get the stone to the temperature of incipient calcination of 1000 degrees F. Tall shaft kilns are often good in this respect. Too much of the length of the rotary kiln is used for preheating.

Apparently there is much room for improvement in the functioning of rotary kilns, and the author has outlined ways in which the efficiency may be increased in an article which appeared in ROCK PRODUCTS, January, 1952, page 138.

FluoSolids

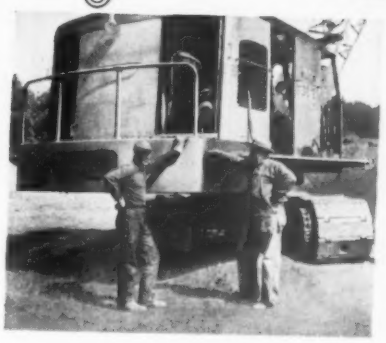
One of the newer calcining processes is the solids fluidization method described by F. S. White of the New England Lime Co. The general prin-

GM Diesel
Case History No. 728-53

USER: Brown Coal Co.,
Center Point, Indiana

INSTALLATION: 38B Bucyrus-Erie 1½ yd. dragline powered by Model 6-71 GM Diesel.

PERFORMANCE: Owner reports stripping 3500 yards overburden per 10-hour day, using 3 gallons of fuel per hour. Mine produces up to 280 tons of coal per day.



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ciples of this process were described in ROCK PRODUCTS, January, 1948, pp. 113-116, and further detail was supplied in the October, 1951, issue, page 136. In the paper discussed herein, Mr. White presented more complete data on the equipment now in use and results obtained after a period of commercial operation.

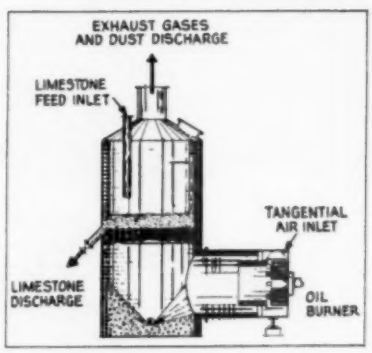
The equipment consists of two units, the first of which, the FluoDry unit, is a steel cylinder 9 ft. in diameter inside and 22 ft. 6 in. high. Attached horizontally at the bottom is a combustion chamber 6 ft. in diameter and 7 ft. 6 in. long. The unit is shown in the accompanying figure. The shaft is divided into two parts by means of a perforated firebrick dome. The lower section is the wind compartment and the upper the bed compartment. Both are lined with firebrick. Limestone of minus 6-mesh size enters through an 8-in. feed pipe at the top. In the bottom of the wind compartment is an oil burner and two air blowers, one to atomize the oil and the other to fluidize the stone. The exhaust gases and dust from the sizer are passed through cyclone collectors and scrubbers to the atmosphere. The sized and dried stone passes through a discharge valve. The following table shows operating data for a unit of this size.

Bed temperature	200-225 deg. F.
Air flow	12,000 c.f.m.
Feed rate	100-125 tons per hour
Oil required	40-60 gal. per 100 tons limestone feed
Power required	98 kw.-hr. per 100 tons limestone feed

The unit is an efficient dryer, but is less efficient as a sizer for it leaves about 7 percent of minus 100-mesh stone in the feed. Operation is simple.

Stone from this unit is then passed to the FluoSolids Reactor. This consists of a vertical steel shell 13 ft. 6 in. inside diameter and 45 ft. high, closed at the bottom with a wind box having a perforated steel constriction plate, and at the top with a steel cover provided with a take-off to the dust collector. It is lined with firebrick and divided with constriction domes into five chambers or stages. The top three preheat the incoming stone, the fourth calcines it, and the fifth cools the lime. This unit is also illustrated. Oil burners supply heat to the calcining compartment. When calcination is completed the lime which fills the chamber to the overflow point passes to the cooler, and additional stone descending through transfer pipes from the successive preheating chambers replaces it.

The major advantage of the process is fuel economy. Approximately 5,000,000 B.t.u. are required to calcine one ton of recoverable lime whereas the rotary kiln requires 7,000,000 to 8,000,000. A disadvantage is the high dust loss; recovery of lime is only 78 percent of the total CaO in the stone. Further study is being devoted to means of obtaining a better recovery. The lime made is of high quality.



Sectional view of FluoDry unit

Kiln Refractories

Two papers on refractory linings of rotary kilns are of interest to operators of both cement and lime plants. The first on periclase refractories was presented by L. W. Austin of the Kaiser Aluminum & Chemical Co. Kiln linings are exposed to severe conditions. Following are the principal causes of deterioration in refractories.

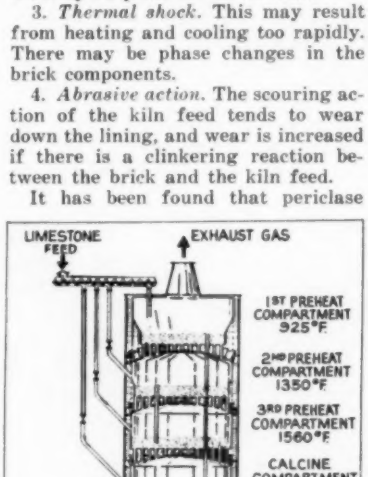
1. *Chemical attack.* At high interface temperatures, changes take place in the refractories themselves. For instance, they may absorb alkalies which hasten disintegration.

2. *Mechanical stresses.* Thermal expansion may cause severe stresses, particularly if the brick are not held securely in place to fit the kiln.

3. *Thermal shock.* This may result from heating and cooling too rapidly. There may be phase changes in the brick components.

4. *Abrasive action.* The scouring action of the kiln feed tends to wear down the lining, and wear is increased if there is a clinkering reaction between the brick and the kiln feed.

It has been found that periclase (MgO) mixed with chromite is a more resistant refractory than magnesite brick when exposed to these disintegrating forces. Periclase is made from dolomite and sea water. The chromite gives the brick a low thermal expansion. A forsterite bond is made by using 2 parts magnesia with 1 part silica in submicron sizes. The finer the silica the greater is the strength of the brick.



Sectional view of five-compartment FluoSolids lime kiln

The second phase of the subject, "Installation Methods—Basic Refractories," was presented by R. M. Olive of the same company. The life of the lining is extended by proper installation. The longitudinal rows of brick must be laid exactly in line with the axis of the kiln. This may be accomplished by following a line of rivets. The rings of brick must be exactly at right angles to the axis. Steel shims are placed between the brick, and cardboard between adjoining rings. The "jack and timber" method is used to lock the brick in place when one half of the circle is completed, and the kiln is then rotated to proper position for completing the second half.

Limestone Reserves

The heavy demands for high-grade limestone which is applied to innumerable uses has resulted in a perceptible depletion of available reserves in some localities. In other places reserves at depth are extensive, but mining costs increase as mines become deeper. A recognition of the need of more precise information on limestone reserves has led several universities and state geological surveys to conduct re-examinations of limestone deposits, and to revise older reports. The results of two such surveys were presented at this meeting.

Newton E. Chute of Syracuse University described the occurrence and uses of the Onondaga limestones in the Hudson Valley of New York. The areas covered were chiefly in Albany, Green, and Ulster counties. The limestones of the region are now supplying the needs of five cement plants and two crushed stone operations. Both lime and building stone have been produced in past years. The deposits are extensive.

The second paper by Carlyle Gray of the Pennsylvania Geological Survey described the high-calcium limestones of the Anneville belt in Lebanon county, Penn. The geologic structure is characterized by overturned folds, drag folds and other complex features. The reserves are large. The beds at Anneville are at least 240 ft. thick, but detailed geologic work is essential to their intelligent development.

Industrial Gypsum

C. M. Lambe of United States Gypsum Co. described the industrial uses of gypsum in ceramic manufacture. Gypsum in the raw state is used as a constituent of container glass for

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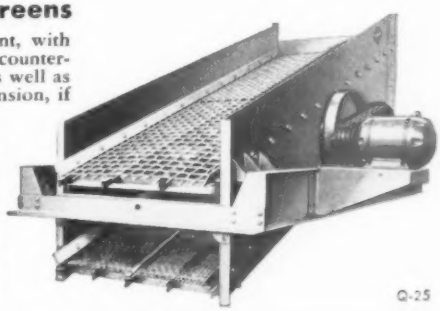

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which it furnishes SO_2, giving a clear glass. It decomposes before melting. It must be low in iron, of high purity, and must be ground to 100 percent through 20 mesh, and 50 to 90 percent through 100 mesh.

Other industrial uses require the calcined gypsum, which is plaster of paris. Gypsum calcined under pressure at 250 degrees F. gives a better plaster than when calcined at atmospheric pressure. The product of pressure calcining is known as alpha plaster. Plasters vary in expansion up to 2 percent during setting. Expansion can be controlled, and it must be controlled very carefully when the plaster is used for ceramic molds. A good alpha plaster mold will make 150 to 250 pieces of pottery. A low setting expansion is essential. Plasters are also used for bedding plate glass sheets during grinding and polishing.

Phosphate Exploration

A progress report by R. W. Swanson and several other geologists described the comprehensive investigations conducted by the U.S. Geological Survey on the phosphate deposits in northwestern United States. Extensive mapping has been done in Montana, Wyoming and Utah, but much remains to be accomplished. More than 1000 samples have been taken from 185 localities, and 700 of them have been analyzed and the data filed. The purpose has not been to delineate areas suitable for commercial development, but rather to indicate where the most promising areas exist as a basis for more detailed study at a later time. Sampling is difficult because the phosphatic shales are soft and the exposures have slumped. Machine trenching is necessary in places. This investigational work has revealed the presence of several new deposits, one large deposit in Montana, for instance, and another on the Montana-Idaho boundary.

Strip mining is an important new development in Montana. Conditions are less favorable for this method in Idaho.

The recovery of various elements associated with phosphate rock may attain increasing importance. Fluorine, although present in very small percentages, occurs widely. Vanadium, the content of which ranges in places from 0.1 to 0.5 percent is recovered at Trail, B.C. At Pocatello, Idaho, vanadium, chromium and nickel are recovered. Uranium is present, but is not now recovered in the northwest.

Logging Phosphate Drill Cores

E. F. Dressner of International Minerals & Chemical Corp. described a method of logging drill cores in the Florida land-pebble phosphate field. Core drilling is an important element in phosphate exploration. The company has two drill rigs constantly in use, drilling on an average two holes a day five days a week. They are drilled to a maximum depth of about 60 ft. About a year ago a geological staff was assigned the task of studying the cores as to color, structure, grain size, presence of impurities, approximate phosphate content and other features. A shorthand descriptive designation has been devised, and this geological logging serves as a guide in later operations. For instance, the data thus assembled enabled the company to avoid mining a section of the deposit that could not be concentrated with available equipment. The logged cores are later analyzed and tested more completely.

Geologists Study Florida Phosphate

James B. Cathcart and D. F. Davidson of the U.S. Geological Survey described work done by the survey since 1947 on the composition, distribution and origin of Florida land-pebble phosphate. The rocks are of Cenozoic age. The top member consists of terrance sands, the middle formation the Bone Valley, and underneath the Hawthorne. In the southern area the phosphate pebbles are 0.1 to 1 mm. in size. In the northern area the pebbles are larger, coarse pebbles ranging upwards from 1.2 mm. Material classed as fine is minus 1.2 mm. in size. In general the areas of fine pebbles are higher in phosphate than areas where coarse pebbles are abundant. Fine phosphate appears in dips and hollows of the Hawthorne. Phosphate areas have been carefully delineated and mapped. The Bone Valley formation carries most of the phosphate. It is assumed that it was derived from the underlying Hawthorne, but the geologists seemed reluctant to explain where the Hawthorne obtained it.

Lightweight Aggregate Studies

Lightweight aggregates are attaining increasing importance, particularly in the field of perlite utilization. Accordingly much interest is centered in the bloating properties of rocks and minerals when they are calcined. Charles M. Riley of the University of Minnesota presented results of a series of studies made on the relation of chemical composition to bloating. Two conditions are necessary for bloating, (1) the material must produce a high temperature glassy phase with a viscosity high enough to trap a gas, and, (2) some substance must be present that will liberate a gas at a temperature at which a glassy phase is formed. The author constructed a phase (composition) diagram in the form of an equilateral triangle, the top point of which represented 100 percent SiO_2, the lower left corner 50 percent Al_2O_3, and the lower right corner 50 percent of the oxides of Ca, Mg, Fe and alkalies. On the basis of their composition determined by chemical analyses, many materials were spotted within this triangle, and it was found that materials falling within an area near the center of the triangle generally had good bloating properties. It was also found that if enough silica and alumina were added to nonbloating clays to give them compositions conforming to points within this area they then possessed bloating properties. An interesting development that may lead to further fruitful research was the discovery that many igneous rocks have compositions that fall within the area of bloating, and when these rocks were ground, briquetted and fired they were found to have good bloating properties. If rhyolites, dacites, trachytes, and even granites and syenites were tested it might be discovered that sources of materials for lightweight aggregates are more widely distributed than appears at present.

Asbestos Mining and Milling

Asbestos has become an important building material. Combined with portland cement in the proportion of 15 to 20 percent asbestos to 80 or 85 percent cement, it is used for the manufacture of vast quantities of roofing shingles and plain or corrugated siding. The only mine in the United States producing large quantities of fiber suitable for such uses is that of the Vermont Asbestos Division of The Ruberoid Co. near Eden, Vt. Michael J. Messel of that company described mining operations and the construction and operation of the new mill.

The first step in prospecting for asbestos is to make a magnetometer survey which is an effective means of delineating areas of serpentine, which is the host rock of the asbestos. Core drill holes are then sunk in the serpentine on a 100-ft. grid system. The cores are milled and the fiber is recovered and evaluated. A shaft is then sunk close to a promising drill hole, and bulk samples are taken for more complete mill tests.

The present quarry face is 100 ft. high. Two Marion shovels are used for loading. Primary reduction is by means of a 48- x 60-in. jaw crusher. Secondary reduction is in cone crushers.

The concentration plant embraces the most modern devices known in asbestos milling. Briefly the process consists in reducing the rock in successive stages, and removing the fiber by air suction at each stage. The importance of air separation is indicated by the fact that one-third of the power consumption is for handling air. Asbestos is a bulky material to handle, but, by a new method of compression packing to 56 lb. per cu. ft., it occupies only half the space formerly required.

(Continued on page 157)

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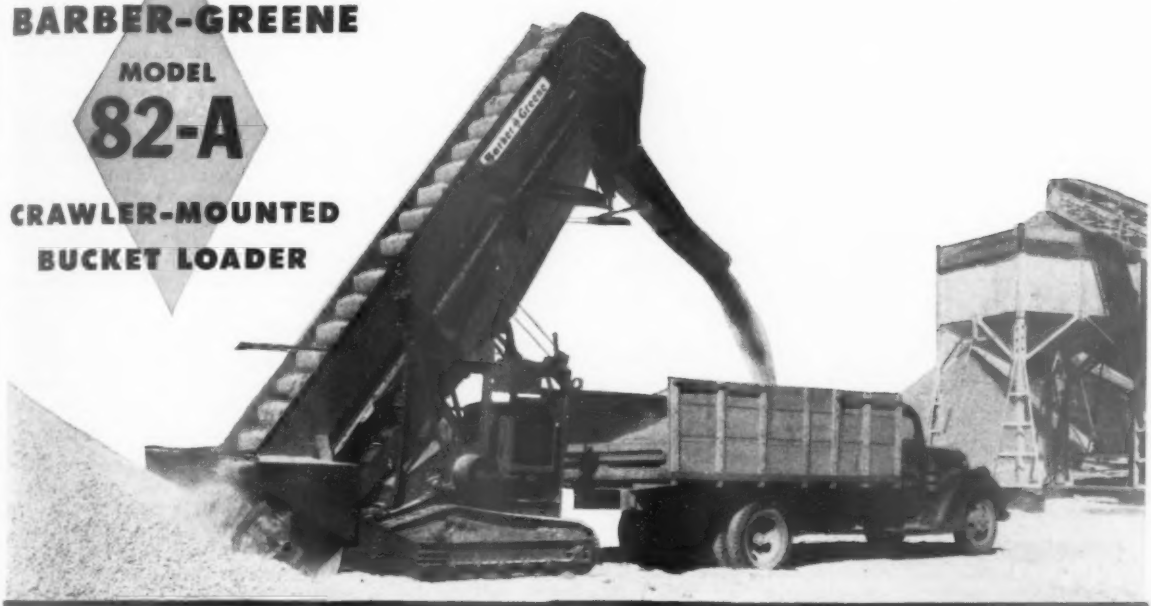

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Steam Tempering of Cement

By D. A. WADIA*

DURING THE LAST two or three decades numerous improvements have been introduced in the portland cement industry that have resulted in better plant efficiencies and production of a more uniform portland cement. Closed circuit grinding, more rigid control of composition, advances in burning techniques, and air quenching of clinker have all helped directly or indirectly in improving the performance of portland cement.

There remain but two important aspects of portland cement technology that have not as yet been given due recognition—particle size distribution in cement and controlled tempering. The first of these is a subject on which no final rational solution has as yet been worked out; with regard to controlled tempering, however, it is rather surprising that this important means of quality improvement has been so completely overlooked in the past.

Present Methods of Treatment

The term "tempering" as used in present-day practice is restricted to the slaking action of moisture from the atmosphere or deliberately added water on any free lime that may be present in unground clinker. It is also contended that watering helps in minimizing setting time irregularities.[1] Watering of clinker, however, can at best be described as a crude and haphazard method of slaking out the free lime in clinker. There is little effective control over the rate or extent of treatment, so that the chances of excessive moisture absorption (and consequent deterioration in the strength-developing characteristic of the cement) are considerable. Its usefulness is in any case limited, since the water can come into contact with only the surface of the clinker and not its inner core, so that tempering is restricted to the superficial layers of the clinker nodules.

In addition to the above mentioned treatment methods, it has been pointed out that at the high temperature incident in grinding mills, the moisture given out by partially dehydrated gypsum can contribute to the seasoning of clinker, particularly in the retardation of set (a characteristic of tempering at elevated temperatures). Any such tempering occurs more by chance than design.

*Assistant chemist, Bhupendra Cement Works, Surajpur, India.

Steam Tempering Process

The features connected with direct watering of clinker (or dependence on atmospheric tempering) do not occur in the case of steam treatment of portland cement. Firstly, because of the far greater reactivity of the finely ground cement, the tempering reaction can proceed to completion much more quickly and certainly. Secondly, steam is a flexible and convenient medium, capable of being used over a wide range of temperature and pressure, mixed or unmixed with air. Close control under any desired conditions is, moreover, readily obtainable.

Treatment at elevated temperatures is known to modify beneficially almost all the important characteristics of portland cement. For a fuller background on the subject, reference should be made to Roller's excellent article published in *Industrial and Engineering Chemistry*, vol. 28, page 362 (1936). The paper surveys past work in the field and also provides information on Roller's own findings on the important advantages of steam treatment.

The beneficial effects of steam tempering have long been recognized and a number of processes for steam treatment of portland cement have been patented. These methods, however, have not been regarded with favor because of there being no really effective control over the rate of steam absorption, and because the arrangements for agitating the cement were inadequate. Both these factors tended to produce over-tempered cement. Over-tempering is definitely objectionable, since the resulting cement's strength-giving potential is adversely affected. These difficulties, however, cannot be regarded as insurmountable.

Steam Absorption

Steam absorbed by the cement for reaching the *t*-state of tempering† can be said to have three functions: (1) activation of C_3S; (2) slaking of free lime; and (3) slaking of uncombined MgO.

Activation of C_3S. The rate at which steam is absorbed by cement is dependent upon (1) the fineness (finer cements being tempered at a quicker rate) and (2) degree of previous tempering.

In actual practice the cement will be of more or less uniform fineness, so that variations in tempering rate due to this cause will be negligible. The factor to be taken into account is the extent to which the cement has been previously treated. Upon this depends not only the rate of tempering, but also the amount of water vapor absorption required for "*t*-seasoning." With increasing degrees of previous treatment of clinker, the quantity of steam absorption required for "*t*-seasoning" is reduced and, also, the rate of steam absorption is slowed down.

Therefore, the decreased rate at which moisture is absorbed by already partly treated clinker will insure to some extent that excessive moisture absorption does not take place. But, obviously, it is highly desirable to keep such variations at a minimum by protecting the stock of gypsum and clinker from rain, etc. In several cement plants this aspect has received little attention and it is common practice to store both clinker and gypsum in open yards. Providing covered storage for gypsum and clinker may mean a sizable capital outlay, but it is well worth it, both from the point of view of insuring a more uniform finished product and the elimination of difficulties commonly experienced in rainy seasons due to the choking of wet clinker and gypsum at mill feed tables.

According to Roller's findings, the absorption required to reach the *t*-state ranged from 0.3 to 0.9 percent; this being as much as 0.7 percent more if the initial state had not corresponded to a clinker that has suffered exposure to the atmosphere during storage.

Slaking of free lime. Since the slaking of free CaO is the most rapid of all the reactions which take place during the hydration of cement pastes, it can be assumed that this reaction takes place first by preference. There is

†Roller found that tempering up to a certain optimum degree, which he designates as the "thoroughly seasoned state" (for brevity referred to as *t*-state), produced a maximum beneficial effect. Further moisture absorption resulted in objectionable over-tempering. To follow Roller's convention, this objectionable over-tempered state will be referred to for brevity's sake as the *o*-state. The criterion adopted by Roller for defining the *t*-state is based on the fact that as treatment proceeds, there is a reduction in water required for normal consistency. This fall in water requirement continues till a particular degree of treatment is reached. Moisture absorption beyond this point results in an increase in water requirements for normal consistency. Roller defines the *t*-state as that at which water required for normal consistency is at a minimum.

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theoretical justification for such an assumption.

". . . According to Le Chatelier, the vapor pressure of calcium hydrate when cold is practically nil, but that of calcium silicate is several mm. of mercury. At 100 deg. C. it is not more than 1 mm. for the first, but several mm. for the second. Consequently in a mixture of lime and calcium silicate, the lime will hydrate progressively without the silicate being hydrated and the silicate will, if necessary, part with its combined water until all the lime is fully hydrated."[2]

The theoretical percentage of H_2O required for slaking 1 percent of free CaO is 0.32.

Slaking of uncombined MgO. Slaking out of uncombined MgO is considered in a subsequent section. It will suffice to mention here that theoretically the percentage of water required for slaking out 1 percent of uncombined MgO is 0.45.

Temperature Conditions

Roller found that with pure steam at 1 atmosphere, the degree of water vapor absorption for all temperatures above 100 deg. C. increased with decrease in temperature, especially below about 110 deg. C. As temperatures a few degrees above the dew point were approached, the absorption became excessive and increased rapidly as the temperature was lowered further. For actual tempering, a temperature somewhat higher than the dew point would therefore seem necessary to prevent too rapid and excessive an absorption.

When steam-air mixtures at atmospheric pressure were used, it was found that, under equilibrium conditions, T/T_s (where T is the absolute temperature of absorption and T_s is the absolute temperature of the dew point) is a function of the amount of water vapor absorbed, i.e., W, the weight of moisture absorbed, $= f(T/T_s)$.

Pressure Conditions

The use of higher pressures of steam (as a consequence of which the corresponding reaction temperature will be higher) will help in quickening the tempering rate. But from the point of view of economy in cost of installations and running expenses, lower pressures are preferable.

Slaking Out of Uncombined MgO

The question of treatment of high magnesia cements has been taken up separately as this is not a problem confronting all cement plants and also because this particular aspect of cement technology does not seem to have been the subject of experimental study.

It is well known that only the "uncombined" and not the total MgO content of a cement is responsible for delayed expansion. Uncombined MgO is present in appreciable quantities only in those cements having an unusually high MgO content (about 2.5 to 5 percent). The phenomenon of delayed expansion is due to the property of crystalline MgO (periclase) to hydrate slowly in water at ordinary temperatures, but rapidly at higher temperatures with a considerable increase in volume.[3] At the elevated temperatures at which steam tempering takes place, therefore, the uncombined MgO content of a cement should be slaked out. This point, however, does not seem to have been investigated to date, and will have to be confirmed by experiment. It is quite possible, of course, that the tempering will have to be carried out under higher temperature-pressure conditions.

The amount of uncombined MgO present in a high magnesia cement is closely dependent upon the glass content of the cement. Cements prepared from quickly cooled clinker show low autoclave expansions, but those prepared from slowly cooled clinker, or from clinker burned at lower temperatures—and hence containing little or no glass—show high expansions. The lower expansions shown by rapidly cooled clinker are due to their high glass contents. At clinkering temperatures MgO will dissolve up to about 6 percent in the liquid phase, and if the mass is then frozen, the MgO will remain in the glass.[4] Lerch's experiments[5] indicate that the maximum amount of undissolved MgO present in a cement (which has a maximum MgO content of 5 percent) is not more than about 0.6 percent when the clinker has been rapidly cooled, and is about 1 percent when cooled slowly.

In recent years the use of air quenching installations (in which a blast of cold air is passed over the hot clinker as it emerges out of the kiln, causing it to chill rapidly) have become popular. The clinker that is thus air quenched has a considerably lower autoclave expansion than that of a corresponding slower cooled clinker, due to its higher glass content. Another feature of air-quenched clinker is that the average grain size of the periclase is noticeably smaller than in the slowly cooled clinker.[6]

The advantages of air quenching of clinker followed by steam treatment of the ground cement are obvious. By resorting to air quenching, not only will the amount of MgO to be hydrated out be reduced, but also the finer state of subdivision of the periclase in the air-quenched clinker will greatly facilitate the slaking reaction. In the case of high magnesia cements, therefore, the use of an air quenching installation along with the steam tempering process is not merely desirable but imperative.

Advantages of Steam Treatment

There is scarcely a single important characteristic of portland cement that is not modified beneficially by steam treatment. Provided of course that there is no over-tempering this beneficiation does not in any way reduce a cement's strength characteristics.

Setting time is retarded. The retardation is of a more stable and permanent nature than that brought about by gypsum addition (the retardation being particularly marked in the case of high C_3S content cements); difficulties due to irregular setting behavior will thus be greatly minimized. Further, it will be possible to reduce appreciably the optimum gypsum requirement. The present maximum percentage of gypsum addition permitted by cement specifications is in many cases well below the quantity required for optimum results.[7] In particular, cements with high alkali, high C_3A, or of extreme fineness require greater than normal quantities of gypsum for optimum results.

Reduction in water requirement for normal consistency. This characteristic will permit the use of lower water-cement ratios, thus improving the absolute strength development potential of concrete. Fine cements, which require higher water addition for normal consistency, in particular, stand to benefit considerably. A further point of great importance is the rather surprising finding of Roller's that with increasing fineness of grinding the water requirement for normal consistency registered practically no noticeable increase.

Lowering of heat of hydration. Because tempering up to the *t*-state consists principally of activation of C_3S (an exothermic reaction), lowering in heat of hydration will be most marked in the case of high C_3S content cements. What from the practical point of view is of more importance is that this lowering will be in the early age heat of hydration.

It is interesting in this connection to note that according to Lerch,[8] one of the causes of the higher heat of hydration of air-quenched clinker is that the C_3S content of a medium or high A:F ratio cement will be higher in a clinker containing glass than in the same clinker cooled slowly to give a low glass content.

In addition there will be lowering due to slaking out of free CaO. This lowering in the early age heat of hydration can be quite appreciable, since 1 percent unslaked lime liberates 2.6 calories during hydration.

Further lowering can be expected because of hydration of MgO, 1 percent MgO liberating 2 calories of heat during hydration. It should be noted that in this case the heat evolution would be spread over a considerable period and will not markedly increase the heat of hydration of cement pastes at early ages.

Complete slaking out of free lime. Steam treatment provides a certain guarantee that all uncombined lime is

(Continued on page 17

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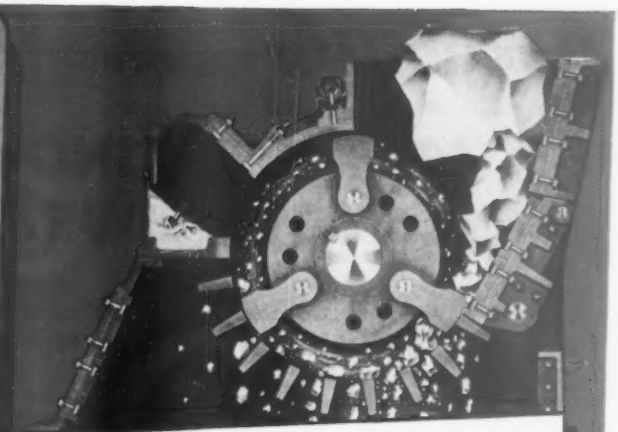

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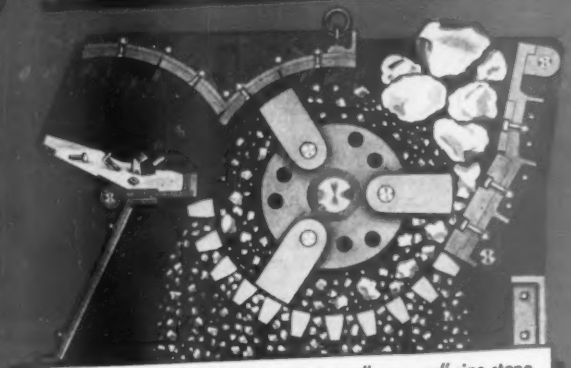

2 **The "SLUGGER"**—Reduces "one-man" size stone (75 to 100 lb. pieces) to 1¼", ¾" or Agricultural Limestone in One Operation. Capacities 4 to 100 tons per hour.

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STILL DEBATING WHAT IS DURABLE CONCRETE

American Concrete Institute elects A. T. Goldbeck president. Curing and concrete durability topics highlight convention program

IF THERE WAS ANY SINGLE impression one could bring away from the 48th annual convention of the American Concrete Institute, at Cincinnati, Ohio, February 26-28, it was that concrete is improved by any and all methods of mixing, placing and curing, which *reduce the amount of water* left in the concrete. While none of the papers or discussions emphasized this fact very pointedly, the trend of thought was certainly in that direction, although on the subject of curing concrete there were just as many contrary opinions expressed as ever.

Harry F. Thomson, president, presided at the opening session, and after the annual presidential address, presented the institute awards for meritorious papers at the Wednesday luncheon meeting. The election of A. T. Goldbeck, vice-president, to be president for the ensuing year was announced. As probably all our readers know, Mr. Goldbeck is and has been, for more than 25 years, engineering director of the National Crushed Stone Asosciation. C. H. Scholer, professor and head of the department of applied mechanics, Kansas State College, Manhattan, Kan., was elected for a two-year term as vice-president. Elected to three-year terms as members of the Board of Direction were Dr. A. Allan Bates, vice-president of research and development, Portland Cement Association, Chicago; J. W. Kelly, civil engineering department, University of California, Berkeley; F. N. Menefee, professor of engineering materials, University of Michigan, Ann Arbor; and Bailey Tremper, materials and research engineer, Washington State Highway Department, Olympia. Henry L. Kennedy, manager of the cement division, Dewey and Almy Chemical Co., Cambridge, Mass., elected for a two-year term as vice-president in 1951, continues in that office.

A. T. Goldbeck, engineering director of National Crushed Stone Association, was elected president of the American Concrete Institute for 1952

The chief other notable event was the Harvey Whipple Luncheon, attended by the entire convention, to honor the retiring secretary of the institute after many years of faithful service. He is succeeded as acting secretary by Fred F. Van Atta, who has been assistant secretary. Mr. Whipple utilized the occasion to pay tributes to the various members of his staff, who in some instances have also served almost as long as he.

President-elect A. T. Goldbeck, left, poses with A.C.I.'s retiring secretary-treasurer, Harvey Whipple, center, and past president H. F. Thomson

Durability of Concrete

The subject of durability of concrete took up an entire session, which was chiefly a repetition of things that have been said and written many times before. For example, a paper reporting the results of a survey of concrete structures built by the railways during the past 30 or 40 years showed the usual experience. It was concluded that the causes of deterioration were found to be too much mixing water in the concrete, deleterious aggregates which caused pop-outs, excessive seepage of water from embankments, and volume change due to shrinkage. The reporter described a research program at Purdue University sponsored by the Association of American Railroads designed to develop an acceptance standard for waterproof paints and bituminous coatings for concrete structures. This at least would keep seepage water out of the hardened concrete, and recognizes the part such water plays in concrete disintegration.

A second paper on the same subject—railway experience with concrete—also concluded that too much water was the cause of most troubles. Drier mixes, formerly used, accounted for good old concrete, it was said. Some structures on the Baltimore and Ohio R. R. were said to show disintegration as a result of alkali-aggregate reaction, although it was emphasized that this was not the only or even the chief cause of disintegration in the experience of B. & O. engineers. This statement was accepted as proof that the alkali-cement-aggregate reaction is much more widespread than originally believed.

Frank H. Jackson, Bureau of Public Roads, Washington, D.C., said that, so far as pavements were concerned, air entrainment was more important than the water-cement ratio, if the water-cement ratio were kept within bounds for concrete of adequate strength design. While he believed air entrainment an important factor in preventing the deterioration of concrete pavements, particularly where salts are used in freezing weather, he is not ready to accept air entrainment as the final answer to durable concrete. It does have the advantage that a higher cement-water

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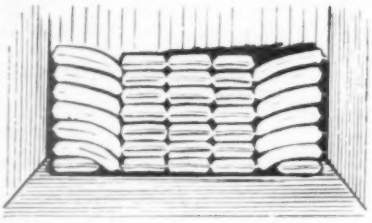
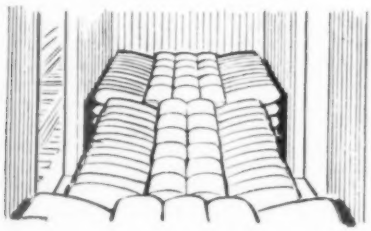
Cover floor with good grade of car liner and put at least three thicknesses on door edges. Line walls, too, if they are in bad condition. Use asphalt-laminated paper to seal door cracks against dirt, rain, snow and cinders.





FOLLOW THESE LOADING RULES:

1. The car should be loaded so that the filled bags will not come in contact with side doors.

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   b. Follow proper loading patterns. (See illustrations.)

   c. Use retaining strips of special Scotch tape applied across the load, or steel retaining straps covered by one thickness of corrugated board.

2. Bags should be loaded tightly, solidly and flat, to minimize shifting in transit.

3. Balance the load so there will not be more weight on one end or side than on the other end or side.

There are, in general, three different methods of loading—crosswise, brickwall and lengthwise. The crosswise method is generally considered to be the most acceptable.

Loading in car doorways should be done in such a manner that this part of the load acts as a keystone between the loads in the ends of the car. (See illustration.)

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Among those present at the luncheon held in honor of Harvey Whipple were ten past presidents of the institute; standing, l. to r., are Fred F. Van Atta, A.C.I. acting secretary-treasurer; Robert F. Blanks, Great Western Aggregates, Inc., Denver, Colo.; H. F. Gonnerman, Portland Cement Association, Chicago, Ill.; Harry F. Thomson, St. Louis, Mo.; president-elect A. T. Goldbeck, National Crushed Stone Association, Washington, D.C.; Frank H. Jackson, Bureau of Public Roads, Washington, D.C.; and Stanton Walker, National Sand and Gravel Association and National Ready Mixed Concrete Association, Washington, D.C. Seated, l. to r., are Morton O. Withey, University of Wisconsin, Madison; Douglas E. Parsons, National Bureau of Standards, Washington, D.C.; Harvey Whipple, A.C.I. retiring secretary-treasurer; Raymond E. Davis, University of California, Berkeley; R. B. Young, Hydro-Electric Power Commission of Ontario, Toronto, Canada; and Herbert J. Gilkey, Iowa State College, Ames

ratio can be used with air entrainment and still get good concrete, than is the case when air entrainment is not employed.

The durability of concrete in hydraulic structures was discussed by Lewis H. Tuthill, Bureau of Reclamation, Denver, Colo., and Byram W. Steele, formerly with the Corps of Engineers, now consulting engineer, Miami, Fla. Mr. Tuthill admitted that it was continuous saturation of the concrete that makes the problem of durable concrete in hydraulic structures the most difficult. He said it was desirable to use as little mixing water as possible and to keep outside water out after the concrete has hardened. Other ways of reducing both the water and the cement content of the concrete are to use as much coarse aggregate as possible and as little sand as possible.

Mr. Steele said that as yet we have not scratched the surface in determining the factors which make for long life of concrete. He said that it is the infiltration of water into the interior of hydraulic concrete structures that does the dirty work; that since the cement is more soluble than the aggregate, the water breaks the bond between the cement and the aggregate. Mr. Steele contended that air entrainment cuts down permeability as does also long continued hydration of the cement. The use of a pozzolan helps toward higher impermeability. He recommends the use of pozzolans and a low cement factor.

Curing Concrete

A symposium on curing concrete was of interest to our readers only indirectly, since the producers of concrete and concrete materials are supposed to end their responsibilities when the materials are delivered to the job. However, the various engineer contributors to this part of the program made it quite evident that what happens to the concrete in the first few days after it is placed has an important bearing on its quality and durability. There was no unanimity of opinion on how concrete should be cured. There apparently should be plenty of water in it at one time, and a minimum at another time, but the timing is a matter of difference of expert opinions.

Materials and Properties

Differential coefficients of expansion of cement paste and aggregates of various mineral compositions is the latest disease exploited by the Waterways Experiment Station of the Corps of Engineers at Jackson, Miss., to account for some concrete disintegration. A rehash of data that have been published before was presented by Edwin J. Callan, of the experiment station. Another review of the situation was presented in a paper by Delmar Bloem, Stanton Walker and W. G. Mullen, of the National Sand and Gravel Association. They concluded that thermal expansion of concrete and mortar containing different aggregates varied approximately in proportion to the thermal coefficient and quantity of aggregate in the mixture; an approximation of the thermal coefficient of expansion of aggregate may be made from determinations of the thermal coefficients of concrete of varying proportions; changes in temperature were destructive of the concrete with sudden changes being much more severe than slower ones; and concretes having higher coefficients of expansion were less resistant to temperature changes than concrete with low coefficients. No relationship was found, in these tests, between resistance of concrete to temperature changes and differences between thermal coefficients of aggregates and mortars.

J. J. Shideler, Bureau of Reclamation, Denver, Colo., summarized past information published on the effect of calcium chloride on the properties of concrete and reported recent bureau tests with this material. Effects of type of cement, age, temperature and mix proportions on the strength of concrete containing calcium chloride, as well as the effect of calcium chloride on volume change, heat generation, time of set, alkali-aggregate reaction, resistance to abrasion and sulfate attack on concrete were considered.

C. H. Scholer and G. M. Smith, Kansas State College, Manhattan, added new data on the use of fly ash in concrete. A 20-30 percent replacement of the cement by fly ash effectively inhibited cement-aggregate reaction in the concrete while imparting better workability and finishing properties.

Concrete Construction

Only two of the papers on concrete construction appeared to have much interest to our readers. One of these was by K. P. Billner of Vacuum Concrete Corp., Philadelphia, Penn., who illustrated his talk with moving pictures and lantern slides. Most of the jobs illustrated were abroad, for there seems to be much more hesitation on the part of engineers in this country to utilize the process than elsewhere in the world. Specially designed vacuum mats remove the excess mixing water from concrete and induce early hardening which permits removal of forms and handling of the cast members hours before it is possible with ordinary concrete methods. Vacuum lifters eliminate the necessity for lifting eyes or bolts in slabs or panels. This equipment was used in the construction of reservoirs, canal linings, large-diameter pipes and components of apartment buildings. As a matter of fact the slabs or other thin shapes are removed from the forms in some 15 minutes after placing the concrete. They can then be walked on without leaving an impression, lifted out of the forms and stacked outdoors without any further "curing." This to our mind is really definite proof that removing the excess water just as soon after placing as possible, bringing the particles of cement and aggregate together by sed-

(Continued on page 161)

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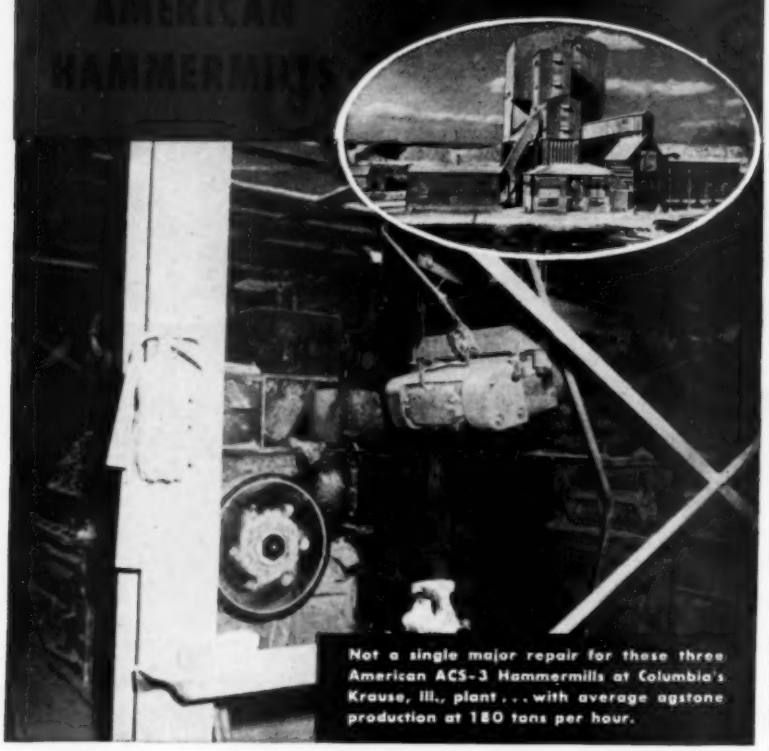

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Rocky's Notes

(Continued from page 81)

of the oxygen ions of the cement gel by hydroxyl bonds (H-OH) on both exterior and interior surfaces of the colloidal cement particles. Some of these hydroxyl bonds are broken and driven out as water by heating or drying out, but the damage to the cement paste has already been done when it hardens with this excess of water. It leaves a porous material with many hydroxyl ions, which readily take on more water, if and when it becomes available, to again refill the pore surfaces. It is this reservoir of water in the interior of the concrete which we believe will eventually be found to be the cause of practically all concrete disintegration.

The old-time cements being coarser ground required less mixing water, bled more, thus rejected more water in setting, hardened more slowly, giving a longer period for bleeding and contained less C_3S. The excess lime in C_3S becomes $Ca(OH)_2$ in the hydrated cement. Now $Ca(OH)_2$—hydrated lime—is generally added to cements for masonry mortar because it is "water retentive;" it holds water. Any one who has worked with lime putty is well aware of this. That is a good property in thin mortar layers between porous brick or block. It is a mighty bad property in mass concrete, for the excess of lime in the hardened paste also acts as a reservoir for water which subsequently takes part in undesirable reactions. It may easily be that the early portland cements had more disadvantages than virtues, but we can't see the logic in declaring that they had no virtues.

Labor Relations Trends

(Continued from page 83)

Court of Ohio came to this conclusion: "Court decisions now seem to firmly establish the rule that picketing or bannering as a means of the exercise of the right of free speech will be afforded constitutional protection so long as it is lawfully conducted, but if it becomes unlawful, then it falls within the category of a civil wrong and must be governed by the law of torts. In other words, the constitutional guaranty of the right of free speech is predicated upon the lawful exercise of such right and if, through conspiracy or unlawful conduct, the result of its exercise unlawfully injures another in his property rights, the guaranty ceases and the exercise of the claimed right by such means may be enjoined or prohibited."

Issue of Secondary Boycott

The Ohio court's decision then continues: "This brings us to a consideration of the character of the conduct of the defendants as affecting the plaintiff in the instant case. The plaintiff claims that the conduct of the defendants was conspiratorial in character and constituted a secondary

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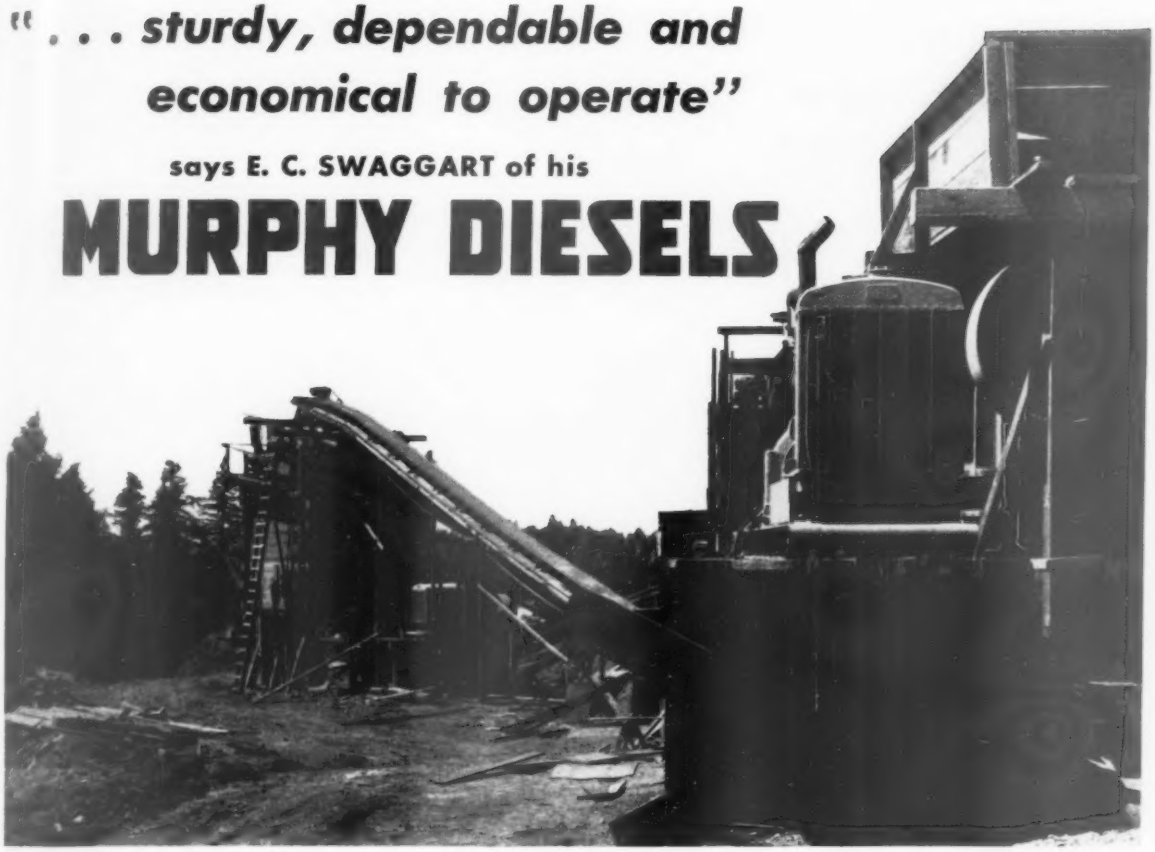

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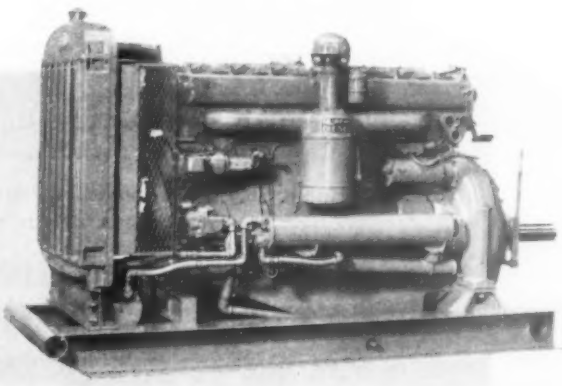

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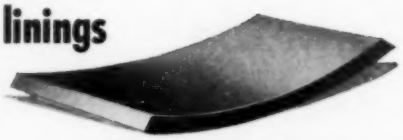

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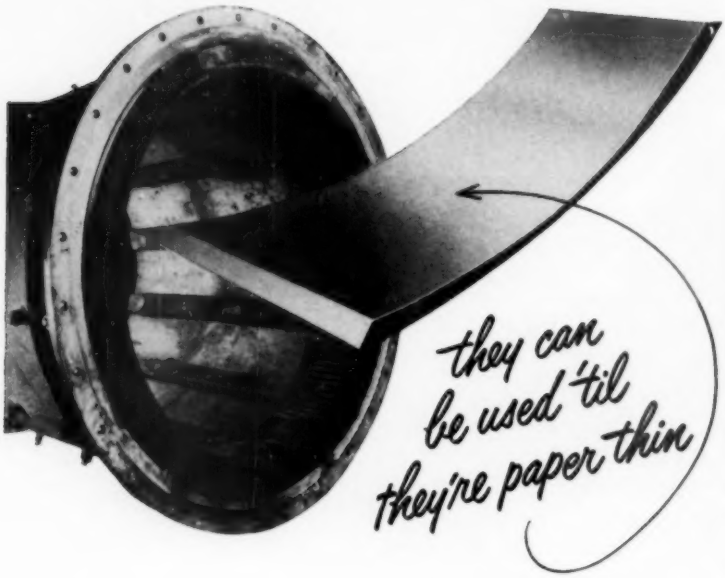

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pressure or secondary boycott injuriously affecting it and, as such, was unlawful. A boycott may be defined in general terms as a concerted refrainment from business relations with another, or a concerted persuasion of third persons outside the combination to so refrain. It may be primary where there is a concerted refrainment from business relations with another, or by peaceful means a concerted inducement of others outside the combination to so refrain; or it may be secondary where there is not merely a concerted refrainment from business relations with the person against whom the boycott is directed or by peaceful means a concerted inducement of others outside the combination to so refrain, but an exercise of economic pressure upon such others to cause them to refrain from business relations with the person against whom the boycott is directed, through fear of loss or damage to themselves if they refuse to do so."

Reviewing the facts in this case the court decided it was a secondary boycott, and then drew the following distinction between primary and secondary boycotts: "Although primary boycotts for legitimate purposes and without the employment of unlawful means are not actionable, an actionable boycott results if it is prosecuted through improper means or for illegal purposes. The common-law rule in a majority of the states of the Union is that a secondary boycott in a labor dispute is unlawful and may be enjoined. The supreme test in determining the right to apply economic pressure is legality. The right to peacefully picket or banner is not free from limitation and does not extend beyond the bounds of legality.

"The reasons for the legal distinction between primary and secondary boycotts, that the latter are unlawful and enjoinable, are that they constitute an unlawful interference with the rights of innocent third persons and of the rights of the public generally, and that one not a party to industrial strife may not, against his will, be made an ally of either one of the parties for the purpose of accomplishing the destruction of the other."

Four of the Ohio Supreme Court justices concurred. One dissented and would have upheld the Court of Appeals decision denying the injunction.

Biggest Shipping Season

HURON PORTLAND CEMENT CO., Detroit, Mich., experienced its biggest shipping season in 1951, since water transportation of portland cement started 35 years ago. The increased tonnage was also moved in fewer trips, as 1951 was a year of unusually high water levels, allowing the ships to carry heavier cargos. In 1949, 200 trips were made; in 1950, the total was boosted to 202 but, in 1951, the greatest total cargo was transported in only 199 trips.

She's looking through someone else's eyes

Few purchases are made without thought of how they will be judged by others.

Men who order more than 85 per cent of all Multiwall bags are well aware of this. They rate* a good impression high on their purchasing check list. This, of course, includes a good printing impression.

When your Multiwall bag puts its best foot forward visually, you take a long step toward both winning and holding your customer.

The *use* of what you sell, and the *re-orders* you receive, *inevitably* are influenced by your bag – how it looks, how easy it is to read, how easy it is to remember.

Most often, the best-dressed Multiwalls are Union Multiwalls. This is one of many good reasons why the biggest users of Multiwalls today look to Union for a greater proportion of their needs than at any other time.

More so every day . . .

IT'S UNION FOR MULTIWALLS

TRADE MARK UNION

*August, 1951 research study.

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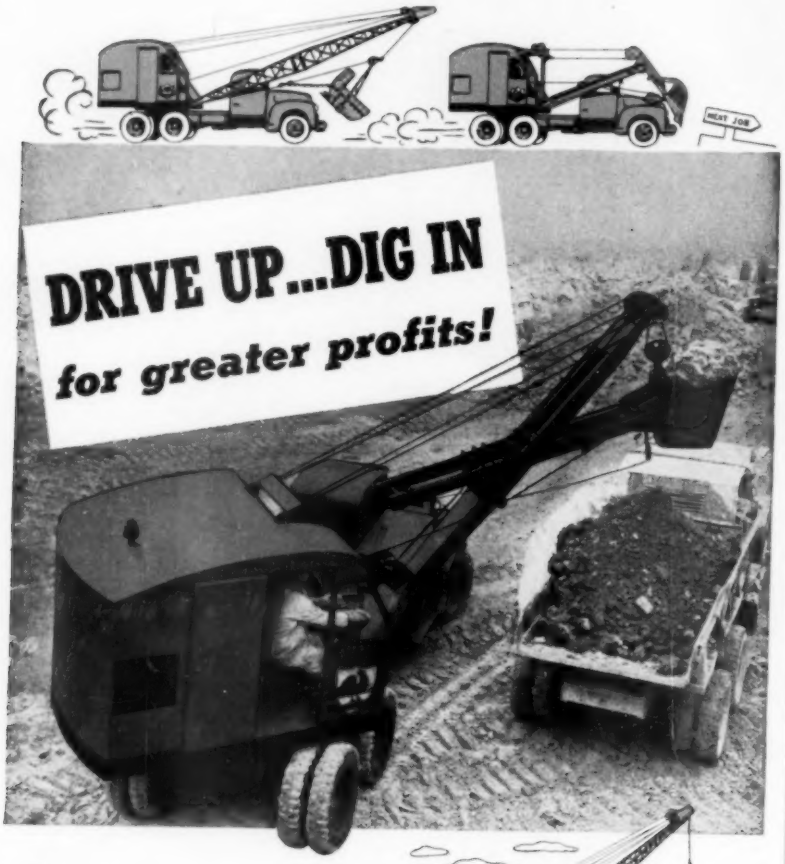

You'll be amazed at the savings you can make by mechanizing scattered earthmoving jobs — *on the same profitable basis as production digging* — with a job-proved Schield Bantam excavator ON RUBBER.

Low first cost — Truck-mounted Bantam costs only a fraction of the price of bigger machines . . . weighs less than 8 tons complete . . . uses only about 1 gal. of gas per hr.

Goes anywhere fast — Bantam drives over paved surfaces, back roads, or cross country at full truck speeds . . . maneuvers in tight spots where bigger rigs can't go.

Investigate today — Join the thousands of satisfied users who are getting more jobs done at less cost with high-speed Bantams. 8 versatile attachments. Write for free literature. Schield Bantam Co., 216 Park St., Waverly, Iowa.

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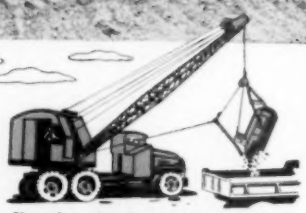


Shovel or dragline loads up to 90 cu. yds. of material per hr. for working small pits, feeding crushers, etc.

Hoe digs 100′ of 5′ trench per hr. Works to 14′ depths. Ideal for sewer and water lines, drainage work, etc.

Clamshell loads up to 70 cu. yds. of loose material per hr. from stockpiles. Crane boom lifts 10,000 lbs.

SCHIELD BANTAM
Cranes • Excavators
Get more jobs done at less cost

Views on Specifications

(Continued from page 122)

shortlived because as soon as this fine fraction was dissolved and neutralized by soil acids the surface would be reduced to a low figure. But if only that part finer than 20 mesh is considered in judging the value of a product this would not occur, as only that part passing the 20-mesh sieve would be considered as worth anything.

Regarding rigid enforcement of specifications, I would not favor barring any product from the market; I would, however, rigidly enforce a law requiring that the various brands are as good or better than their guarantee for that brand. Thus, a brand might be guaranteed to have a total neutralizing power of 102, contain not more than 10 percent of material which will not pass a 20-mesh sieve and have a specific surface of at least 40. Such a material would inevitably be good liming material. Another brand might allow more which will not pass a 20-mesh sieve and might have a guaranteed specific surface of only 35. It should sell at a lower price.

As to the importance of chemical specifications, in view of the opinion of some authorities that impurities in limestone may be helpful to the soil, I will say that unless the guarantee includes an analysis of these beneficial impurities, I would not consider them.

For instance, most limestone in Ohio which I have examined contains a small amount of boron, but the amount is too small to amount to anything as a source of boron in a soil, which really needs more boron if limestone is applied only at the rates needed to control the soil reaction.

The chief impurities in Ohio limestone are silica, and iron and aluminum oxides. Neither of these are of any value to the soil. It already contains a great excess of all these elements. When the Ohio farmer buys limestone, he is buying neutralizing power, and it makes a vast difference whether the stone only has a neutralizing value of 75 percent in one case or 100 percent in another.

Vermont

A. R. Midgley, Vermont Agricultural Experiment Station:

The specifications required in our area are as follows: chemical, at least 50 percent CaO neutralizing value; physical, 98 percent through a 20-mesh sieve and 40 percent through a 100-mesh sieve. The neutralizing value is important. It could be coarser ground—all through a 20-mesh screen with total fines present would be satisfactory. But it should have a good neutralizing value including MgO; minor elements can be used in other ways.

Wisconsin

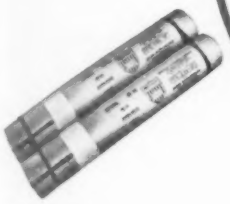
E. Truog, chairman, College of Agriculture, University of Wisconsin:

Several years ago our legislature passed a lime law covering grades of

1
2
3 see how easy it can be...

with AMERICAN'S new 25 pound container-cartridge

AMERICAN CYANAMID COMPANY
EXPLOSIVES



1 Fastened together in units of two each, these new twenty-five pound container-cartridges are unloaded quickly, ready to use immediately.

2 Without any of the wasted time or motion of older methods, American Explosive's new cartridge is loaded easily and directly into each hole.

3 Ready to shoot... note the clearness of the area, no boxes to clear away... the entire loading operation has been reduced to a minimum of time and labor.

And besides these special advantages you can rely on Cyanamid's American Explosives for *quality and dependability*, backed by strict laboratory control and modern methods of production.

For efficient, low-cost blasting results, make your next order American . . . available from plants and distributing magazines in key spots throughout the country.

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High Explosives • Permissibles • Blasting Powder • Blasting Accessories

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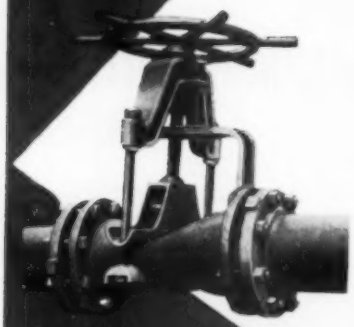

Severe abrasion quickly destroys metal valves while these rubber pinch valves show little wear. They shut tight, even on solid particles. There are no packing glands, and freezing does not damage the patented hinged design sleeve. Sizes 1" to 12" available for continuous pressures up to 100-150 psi.

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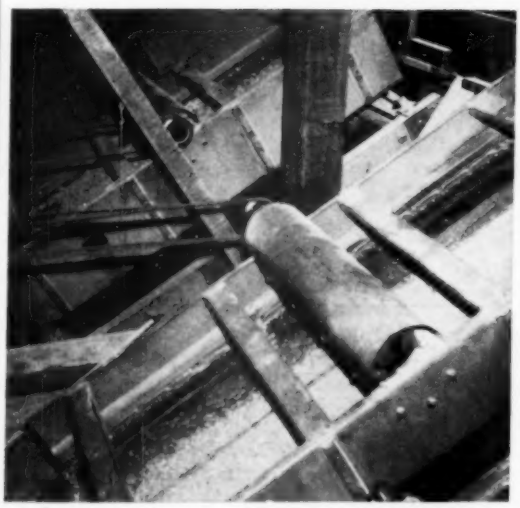
Get Off To A Good Start This Spring With Universals



Day after day Universal Screens are giving trouble-free service in hundreds of Plants throughout the Country.

They're simple to operate, easy on the budget, but above all, they're dependable!

When you're making that proposed change-over this Spring, standardize your screening plant with UNIVERSALS!

Write today for catalog No. 109 on Screens and Screening.

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RACINE — WISCONSIN

lime as determined by fineness of grinding and neutralizing value. Our specifications deal with fineness or size of particles and neutralizing value. We found many years ago that when 50 percent of a sample of ground limestone passed a 60-mesh sieve a fairly satisfactory degree of grinding has been accomplished. Under this specification a sufficient amount of real fine material, that is 100-mesh material, is usually produced so that quick action is obtained when adequate amounts are applied. Also with this grinding there usually is not a very high percentage of real coarse material present. Also when the lime has to be transported considerable distance, it becomes rather uneconomical if the neutralizing value drops below 80 percent or thereabouts.

I believe our law enforcement authorities in this connection make a point to be reasonable in the enforcement of the law. It can easily happen that specifications of a particular sample, due to certain conditions in grinding, etc., may not meet grade requirements to a certain degree and our enforcement authorities take this into consideration. Unless there is deliberate attempt to falsify the situation I believe the specifications of the law should be interpreted rather liberally because of the uncertain and peculiar situation that may develop in grinding.

The impurities that exist in limestone which may be helpful to the soil cannot be given much importance or value in most or practically all cases. Impurities usually consist of clay and silt and of course the farmer cannot afford to pay for such materials when his soil already contains them. Also, the small amount of phosphate which may be present in some limestones is not of sufficient consequence to warrant payment for them unless one were dealing with a peculiar situation such as may be the case where limestone is mined near phosphate deposits.

The importance of chemical specifications depends for the most part entirely on the neutralizing value and in many areas the presence of appreciable amounts of magnesium along with the calcium. It has now developed that in some areas where rather pure calcium stones have been used, deficiency of magnesium has developed. It is true that the calcium stones dissolve or act more quickly than the dolomite or magnesium containing stone but the dolomites when properly ground and applied appear to do the job rapidly enough for all practical purposes.

Mineral Deposits Sold

CARLSON SANDBING CO. and Harris Brothers Contracting Co., Sacramento, Calif., recently purchased from the Reconstruction Finance Corp., limestone and dolomite deposits at Cadiz, Calif., which are considered among the largest deposits in the West. The purchase was made under the name of White Mountain Lime Co.

TODAY'S NEWS IN PORTABLES

THE GARDNER-DENVER 600!

IT'S A 600 FROM THE GROUND UP

Here's a brand-new machine that gives you famous Gardner-Denver dependability in a 600 cubic foot portable. Compressor, engine and undercarriage are all specially designed for high capacity performance.

And a FULL 600

Delivers a full 600 cubic feet of air per minute, actual capacity, at 100 pounds pressure. The compressor is an 8 x 6½ x 6, operating at only 1200 r.p.m.

SMOOTH RUNNING

Moderate operating speed and balanced construction minimize vibration.

FULLY WATER-COOLED

Fully water-cooled compressor cylinders assure low discharge temperatures on the hottest day of the year—properly lubricated cold weather starts. Two-stage design insures higher output for all work.

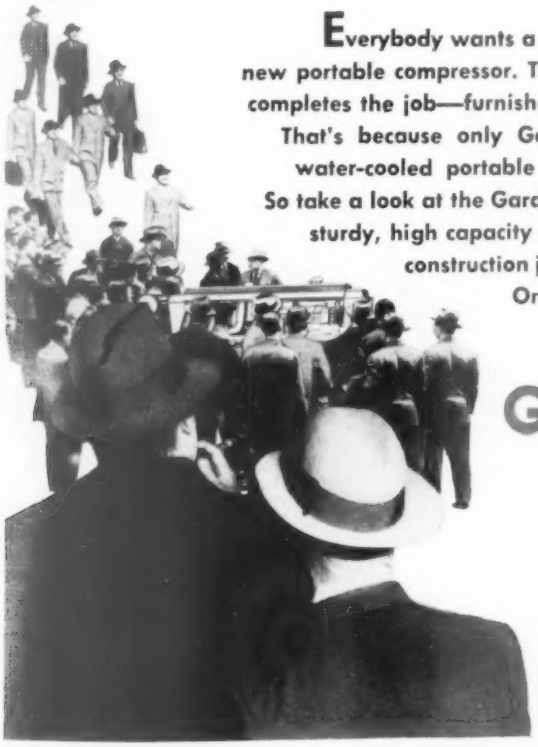
Engineered for Economy

Extra-large valve areas and air passages — properly engineered ratio of low pressure to high-pressure cylinders — are some of the features that raise compressor efficiency—lower operating costs.

RUGGED, STRONG UNDERCARRIAGE

Travels access roads safely—enables you to spot the Gardner-Denver 600 anywhere. Deep oil sumps on both compressor and engine permit off-level operation when necessary.

MORE VALUE FOR YOUR MONEY



Everybody wants a look-see when Gardner-Denver introduces a new portable compressor. They know from experience that a Gardner-Denver completes the job—furnishes low-cost compressed air every single day. That's because only Gardner-Denver makes a two-stage, fully water-cooled portable for all weather, and for any altitude. So take a look at the Gardner-Denver 600 today. See for yourself how this sturdy, high capacity portable can speed your big tunnel and construction jobs. It'll give you new ideas on low bidding. Or write us for the specifications.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

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THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

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FOR FASTER, SAFER WELDING

Use Hewitt-Robins Twin-Weld— 2 Hoses Molded on 1 Line

Speeds Welding: In patented Twin-Weld®, both a green oxygen and red acetylene line are molded in one compact, flexible, easy-to-handle unit. Ideal for use in close-quarter work.

Stops Tangling: Eliminates dangerous tangle of two separate hoses—won't kink—makes welding jobs safer.

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NOW YOU CAN FIGURE YOUR OWN REPLACEMENT CONVEYOR BELTING SPECIFICATIONS

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For the first time you, yourself, can accurately determine the correct specifications of conveyor belting needed to meet the service conditions in your plant.

Bulletin No. 141 gives an easy method of doing it. Through a simple form and even simpler formula, you will know the numbers of plies, weight of duck, thickness and quality of covers needed to handle *your* material at your tonnage and your speed.

Bulletin No. 141 is yours—free! Write for your copy today.

HEWITT-ROBINS HR INCORPORATED

STAMFORD, CONNECTICUT

Trace Elements

(Continued from page 128)

equivalent to one ton of standard ground limestone:

- 1400 lb. of burned or hydrated lime.
- 2000 lb. of agricultural granulated slag meeting the chemical and mechanical specifications for standard ground limestone.
- 2000 lb. of calcium silicate slag meeting the chemical and mechanical specifications for standard ground limestone.
- 3000 lb. of ground limestone screenings.
- 2400 lb. of agricultural marl having a calcium carbonate equivalent of at least 75 percent calcium carbonate.
- 3000 lb. of agricultural marl having a calcium carbonate equivalent of less than 75 percent but not less than 55 percent of calcium carbonate."

Minor Elements in Limestone

Investigations by the Kentucky Experiment Station of the chemical composition of Kentucky limestone and marls revealed the presence of important amounts of cobalt, copper, magnesium, manganese, molybdenum, zinc, nickel, silica, iron, aluminum, phosphorus, sodium and, of course, potash and calcium. The listed minor elements are present in significant amounts ranging from traces to more than 20 lb. per ton of material.

Spectrographic analysis of many samples collected from varying limestone formations in more than 50 counties in Kentucky suggest the rather widespread occurrence of these important minor elements in the state.

The farmers of Kentucky have spread annually about 900,000 tons of liming materials on Kentucky farms during the last several years. With two or more tons being spread per acre, the minor elements if lacking, should be replenished through the application of liming materials to Kentucky soils.

Iowa Agstone Producers

(Continued from page 130)

beginning in 1926 with the capital gains tax to encourage the channeling of new money into expansion. The pattern is seen to be toward more tax concessions rather than to less, Mr. Smith pointed out, and experience is that once a concession is made it is not likely to be taken away.

Besides ordinary percentage depletion, there are two forms of extraordinary percentage depletion. The first is exploration costs, and the second is developmental costs. Exploration costs can be deducted for only the first four years during which these expenses were actually incurred, up to a limit of $75,000 per year. These expenses can be capitalized, that is, set up as a deferred cost and

DU PONT ANNOUNCES

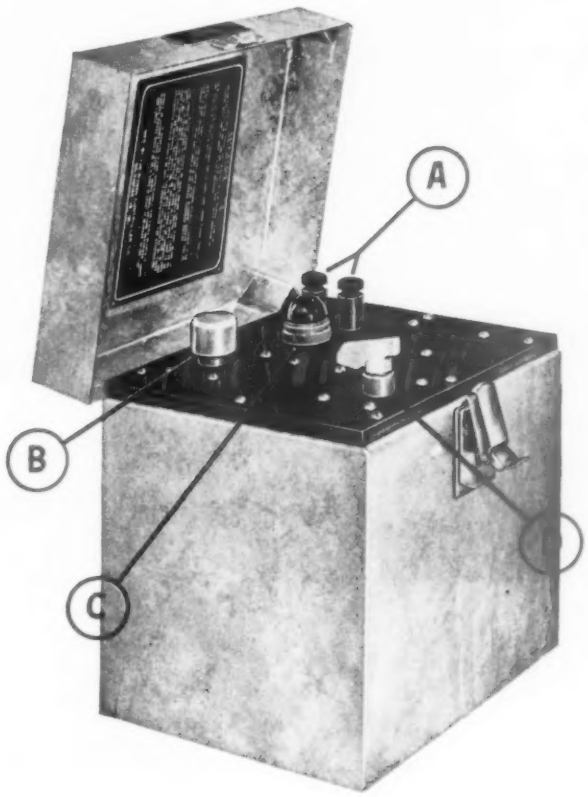
an entirely new type

blasting machine

GREATER CAPACITY

GREATER DEPENDABILITY

GREATER SAFETY



This latest product of Du Pont Explosives Research is a newly designed, portable, condenser discharge type blasting machine. In two models: CD-45 and CD-30.

Both machines have exceptionally high capacity. The larger (CD-45) is the most powerful built to date. Both machines easily fire small tunnel rounds in straight parallel . . . sizable rounds in straight series . . . and a surprisingly large number of caps in parallel series.

These new machines have been thoroughly tested in various kinds of operations throughout the country and have been found suitable for every conceivable type of blasting job, either on the surface or underground. The number of caps fired is not dependent on the physical effort applied by the operator, and the machines contain no moving parts.

Several built-in safety features provide maximum protection at all times. A group of long-lasting, radio-type B batteries are used to charge a number of condensers. At the moment of firing, these condensers deliver a powerful, instantaneous surge of power to the blasting circuit. The terminals are dead at all times except at the instant of firing and can never be made alive unless the operator has both hands on the controls and really means to fire the shot.

THEY'RE SIMPLE TO USE:

1. Connect wires to terminal posts "A" shown in photo above.
2. Depress charging switch "B" and hold until neon pilot light "C" shines brightly.
3. Still holding charging switch down . . . move firing switch "D" to "on" position. This action fires the charge. *Terminals are energized only at the moment of firing* . . . absolutely removing risk of a premature blast. It's as simple as that!

SPECIFICATIONS

The new Du Pont blasting machine is available in two compact models encased in rugged, waterproof, electroplated metal boxes:

MODELS	CAPACITY straight series			
	primary blast	secondary blast	straight parallel	parallel series
CD-30 (small) wt. 24½ lbs. length 9½ inches width 9½ inches height 10½ inches	50	125	25	480 (12 series of 40 each)
CD-45 (large) wt. 31 lbs. length 11 inches width 9½ inches height 11½ inches	50	200	50	1200 (30 series of 40 each)

ASK THE Du Pont Explosives representative in your area for complete information about this new, safer, more dependable, high-capacity blasting machine. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT EXPLOSIVES

Blasting Supplies and Accessories

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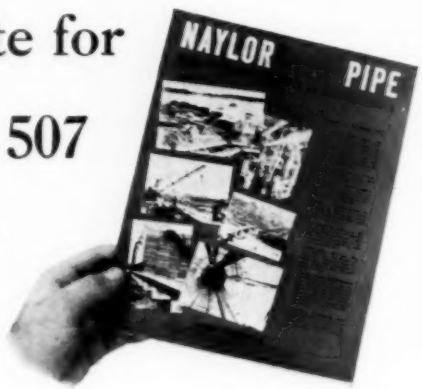

more effectively...

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Naylor Pipe Company
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written off with each ton produced. The advantage of this is that costs greater than the $75,000 allowed for one year can be extended to the following year.

Developmental costs that can be deducted have no dollar limit nor any time limit. Mr. Smith suggested that these, too, be set up as deferred costs and written off with each unit of production. Both of these extraordinary forms of percentage depletion, the speaker emphasized, can be taken in addition to ordinary depletion allowances.

Comments on the subject were given by Robert M. Koch, executive secretary of N.A.L.I., following Mr. Smith's presentation. He was not as optimistic about the perpetuity of depletion benefits as was Mr. Smith; already a movement is afoot to cut them down, he said.

PMA Program

Dewey Cornell, program director for the state Production and Marketing Administration program, was the concluding speaker. He covered problems that had arisen in the administration of the program during the last year. The principal change in specifications, he said, was the elimination of the 100-mesh sieve in tests. Now 80 percent calcium and 80 percent through an 80-mesh sieve are the minimum requirements. If these are not met, extra poundage is required. Mr. Cornell gave three examples of how extra poundage is figured, based on the specification that the calcium carbonate equivalent x percent through an 80-mesh sieve must equal 0.72. Samples for analysis are now going to Iowa State College, he reported. When two consecutive samples meet the specifications, the producer is not required to provide extra poundage in his shipments. To save bookkeeping, no extra poundage of less than 50 lb. is required.

Luncheon Meeting

The Terrace Room of the Savery hotel was the site of the very popular luncheon. A welcome was extended visitors by the mayor of Des Moines. The Iowa governor, the Honorable William S. Beardsley, was also present and gave his welcome and his views on the value of the agricultural limestone industry to the farmer. The association itself is young in years, he said, but has made great progress in extending service to both the producer and the farmer.

Don Reid, managing director, Iowa Press Association, was the luncheon speaker.

Seeks Dredging Permit

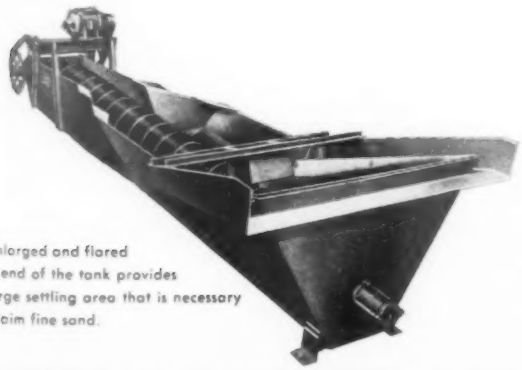
SCHWARTZ SAND & GRAVEL CO., Cleveland, Ohio, has applied to the U.S. Army Corps of Engineers for a permit to dredge sand and gravel for commercial purposes in Lake Erie off Vermilion, Lorain and Fairport, Ohio.

MICHIGAN WASHING PLANT

The Same Clean-Cut Engineering that Characterizes Every A-W Rock and Gravel Plant

Here is a complete gravel crushing, screening and washing plant for the production of aggregate for use in building or highway construction.

With the sizes of units used, total plant capacity is approximately 100 tons per hour. If desired, larger units could be used to increase production to 200 tons per hour, or more.



The enlarged and flared lower end of the tank provides the large settling area that is necessary to reclaim fine sand.

The plant has facilities which insure the production of properly washed and graded aggregate — a fine and a coarse sand, and two sizes of stone. If desired, additional sizes of product can be made.

Because of the simple arrangement, operating costs are held to a minimum. One man is all that is needed to operate the plant. A generator set provides power for the entire plant, including a water pump using about six gallons of fuel per hour.

Two Eagle Fine Material Screw Washers, of the type shown in the accompanying photograph, operating in series, deliver the two sizes of clean graded sand. Similar washers, but without the flared lower end, are used for the stone, to insure the thorough scrubbing action which guarantees clean rock.

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Austin Western

BALDWIN BLH LIMA-HAMILTON

SINCE 1855—BUILDERS OF CONSTRUCTION EQUIPMENT

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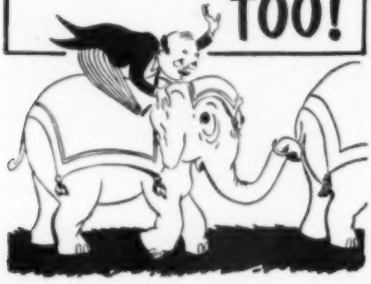

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Wherever hose is used there is a LE-HI hose coupling to match—from small tubing to large industrial applications.... The complete LE-HI line includes:

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- Welding Hose Couplings
- Steam Hose Couplings
- Fire Hose Couplings
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SERIES 100

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- Drilling Hose Couplings
- Oil and Gas Hose Couplings
- Agricultural Hose Couplings

. . . plus complete lines of hose clamps, air valves and manifolds.

Sold through leading distributors and rubber manufacturers only.

"Old Doc" says: "Write now for your free copy of the complete LE-HI catalog"

HOSE ACCESSORIES COMPANY
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LE-HI Makes a Good Connection!

LE-HI
HIGH and LOW PRESSURE
HOSE COUPLINGS
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Cement and Aggregate Specifications

THE CEMENT, AGGREGATES and concrete committees of the American Society for Testing Materials met in Cleveland, Ohio, March 3-7, to review and discuss specifications and tests. The subjects reviewed of most interest to ROCK PRODUCTS' readers were a desire on the part of many members of Committee C-1 on Cement to have an autoclave test required for mortar cements, which practically all portland cement manufacturers are now making. The composition of these mortar cements, or "patented" mortar cements, has long been considered a mystery by the average architect or builder. It has been no mystery in the cement industry, but perhaps for the first time a public admission was made that most of them are about 50 percent portland cement (usually the air-entraining type) and 50 percent ground limestone or raw material. A plasticizing agent of some kind is usually added.

Some manufacturers use pulverized granulated slag instead of limestone, and some possibly use another pozzolanic material. There are also a few manufacturers who use portland cement and hydraulic lime or natural cement mixtures. The ordinary mix made on the job of portland cement and hydrated lime is not considered in this category, although a few manufacturers put out a prepared mix of this character.

The Committee C-1 meeting was enlightened by some large photographs of a "horrible example" of a large brick and concrete block warehouse, the walls of which had cracked and expanded because of the alleged expansion of a masonry mortar that was prepared with a masonry cement said to be a mix of dolomitic hydraulic lime and portland cement. Within a year, it was said that the unhydrated magnesia in the hydraulic lime did hydrate and cause disastrous expansion of the masonry walls. The architect, who happens to be a prominent member of the American Institute of Architects, was naturally very much peeved by the experience, since it seems he had been persuaded to use a mortar cement, where previously he had used a cement-lime mixture.

Apparently, the mortar cement used was purchased on faith. No data were presented to prove that it had passed, or could pass, the present A.S.T.M. steam-pat test for mortar cement, but the exhibit and the presentation led to many arguments for requiring an autoclave test of the same character as now used for portland cement for protection against unhydrated magnesia. However, nothing specific was done at this session because there are apparently other mortar cements containing unhydrated magnesia which have never caused trouble.

Aggregate Specifications

The proposed new Specifications for Concrete Aggregate, which had already been adopted by Committee C-9 as tentative, were revised along the lines suggested in "Rocky's Notes" of our December issue. Attention was called there to the prospect of having a specification for general use, which might contain a test for alkali-cement-aggregate reaction; and the danger of such a specification in the hands of many architects and engineers who are not well versed on this subject. Of course, such a reaction between the alkali of the cement and a siliceous aggregate cannot take place in the absence of water, so it was possible for an architect or engineer to rule out a perfectly good aggregate for dry walls and other concrete not exposed to severe moisture conditions on the basis of such a requirement.

The committee readily recognized this danger and the specification was amended to read that aggregates *exposed to frequent wetting*, or some such qualification be inserted in the place of the previous phrasing, which would have covered aggregates for *all concrete*.

Pennsylvania Agstone Producers Meet

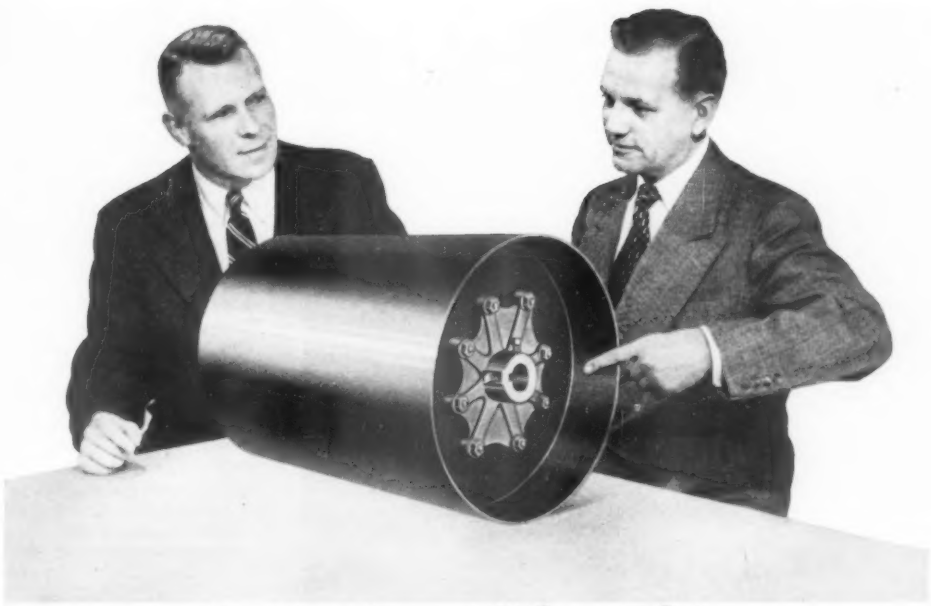
THE ANNUAL MEETING of the Agricultural Limestone Division, Pennsylvania Stone Producers Association, was held at Pennsylvania State College, State College, Penn.

The session was attended by not only agstone producers but also by representatives and officials of the Production and Marketing Adminstration of the U.S. Department of Agriculture.

Leonard S. Fry, chairman, introduced Clyde Zehner, chairman of the state committee, Production and Marketing Administration, who thanked the producers for the cooperation which they had extended in carrying out the 1951 P.M.A. program. He pointed out the need for continued conservation in the field of agriculture. An increasing birth rate, coupled with increased employment and increased exportation of food, places a heavier demand on our food supply.

Mr. Zehner reported that certain forces have been trying to eliminate federal appropriation to continue

(Continued on page 16



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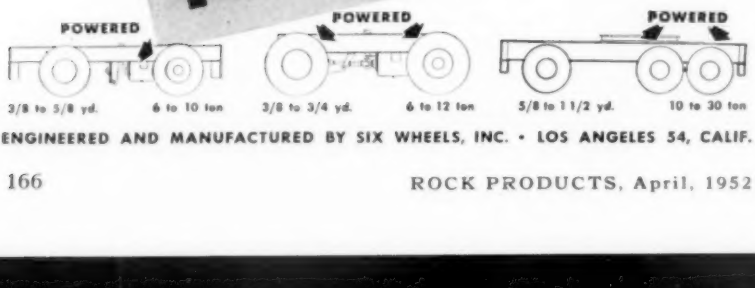

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P.M.A., and that those interested in protecting this appropriation should contact their Congressmen to keep them informed of this throughout the year, not just when the appropriation comes up for reconsideration.

The next speaker was Everett H. F. Felber, assistant area director, Production and Marketing Administration, Washington, D.C., who said that the administration's agricultural conservation program can be defended. Mr. Felber said that in 1953 P.M.A. will devote enough time to each farmer to determine what his farm needs most in the way of conservation. This will be done with the aid of the county committeemen and will result in having more conservation in the future.

Anthony DiSanto analyzed last year's program, discussed briefly the 1952 program, and made the observation that spread service had increased 40 percent during the past four years. In some areas it has been restricted because spreading facilities were not available. Unfavorable weather conditions during December, 1951, brought about the cancellation of orders for some 9000 tons of lime. In 1952, counties will be allowed to set their own deadline for completing the program, to avoid cancellations because of local weather conditions.

Bruce Whitenight spoke briefly on the production goals for 1952, saying that, for the most part, they would be about the same as 1951. Mark Shuman then presented some interesting facts and figures on the increases in production per acre over the last 50 years, in some cases going back as far as 80 years. In a general summary, he concluded that the greatest increases by far came about in the last 15 years, and many of them within the last 10 years.

Sam Omasta, National Agricultural Limestone Institute, spoke briefly on the subject of percentage depletion and the activities in which the national association is engaging at present.

Business Meeting

The opening meeting closed with the introduction of the seven farmer fieldmen who were present for the session. Immediately following was a business meeting of the members of the Agricultural Limestone Division of the Pennsylvania Stone Producers Association.

Mr. Fry appointed a nominating committee and then called for the treasurer's report which was read by H. H. Wagner, secretary, in the absence of H. M. Binkley, treasurer. This was followed by the secretary's annual report which covered P.M.A.'s purchases in 1950 and 1951. Mr. Wagner said that approximately the same tonnage of agstone was used by the Pennsylvania farmers in 1951, as in 1950.

In 1950, the average plant price for bulk material was $3.00, and in 1951 it had gone up to $3.25 per ton

with the average spread for bags and bagging at about $1.50 per ton.

Mr. Wagner then briefly covered activities of the past year, including percentage depletion and specifications.

D. K. Shroyer reported for the committee on advertising and promotion, touching on the highlights of a meeting with a local Harrisburg radio station.

The nominating committee offered the following names as officers and directors for the ensuing year: for chairman, Leonard S. Fry; vice-chairman, D. K. Shroyer; treasurer, H. M. Binkley; and secretary, H. H. Wagner. As directors; in the eastern section, Ivan M. Martin and Fred Roberts; central section, W. O. Faylor and Glenn Hawthorne; and in the western section, P. E. Heim and Herschel W. Lamb.

Mr. Fry then appointed an advertising and promotional committee, consisting of Glenn Hawthorne, William Gearhart and F. Edward George, after which the session was adjourned to the general agricultural limestone and fertilizer meeting at Pennsylvania State College.

A.I.M.E. Meeting

(Continued from page 138)

New Milling Equipment

D. Weston described the aerofall mill. It is a type of ball mill from which fine materials are carried in an air current as fast as they are formed. The coarser materials are returned to a central crushing zone. The equipment is finding application in the industrial mineral field such as asbestos milling.

E. C. Johnson of The Dorr Co. presented a paper on the DorrClone, which is a liquid-solid cyclone. It is a classifier in which separation is accelerated by centrifugal force. It will classify pulps of such high plasticity and high percentage of solids that classification is impossible in gravity sedimentation machines.

New Blasting Technique

The Bureau of Mines has conducted experimental work on blasting at the oil-shale mine at Rifle, Colo., which may be helpful to operators of underground limestone mines. According to a paper presented by Fred D. Wright, in V-cut heading rounds 15 ft. deep, 27 ft. high and 60 ft. wide, it was found that substitution of millisecond delay electric detonators for standard delay detonators resulted in better fragmentation and a reduction in cost of 1 cent a ton in a 29-cent total mining cost. However, their use resulted in excessive "throw" or scattering of the muck piles which reduced shovel-loading efficiency. Timing studies of blasts made with a high-speed motion-picture camera showed an appreciable time lag between the detonation and movement of the rock in front of the hole. Accordingly rela-

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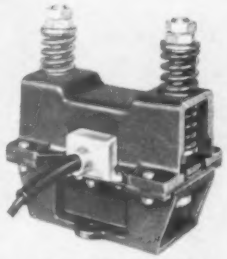

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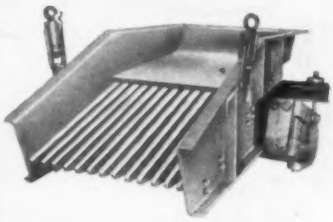

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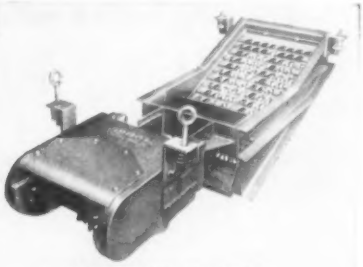

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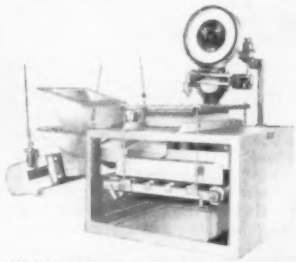

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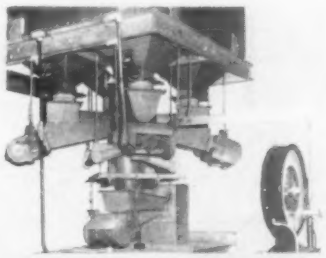

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tively long delay periods were allowed between firing the cut holes and the subsequent slab rows to permit adequate relief of burden ahead of each row. However, the millisecond delay detonators were used for the individual holes in each row. By this method the "throw" of the rock was reduced greatly, and at the same time excellent fragmentation was obtained.

Durable Concrete

(Continued from page 146)

mentation, or in this case by vacuum, is the secret of good, strong, durable concrete. The prevailing idea that cement must be "high-limed" and finely ground in order to hydrate completely in a minimum of time is certainly exploded in this case, for there can hardly be anything like complete hydration in 15 minutes.

The other paper of interest to producers was by Prof. Chuzo Itakura, Hokkaido University, Japan, on "Electric Curing of Concrete in Cold Weather." This method of curing is a curious contradiction of the practice of U.S. Army Engineers in this country who insist on cooling the concrete during placing to 50 deg. F. or lower. By heating the newly placed concrete through bars, electrodes,

Retiring as secretary-treasurer of the institute after 32 years' service, Harvey Whipple, left, is succeeded by Fred F. Van Atta, acting secretary-treasurer

wires, or iron sheets, the temperature is raised to about 104 deg. F., which, according to the author of the paper, makes concrete of higher strengths than concrete cured in the ordinary way. The advocates of cold curing tried to laugh this off by saying such heat curing was confined to small or thin structures, but our Japanese friend said this process had been used with success for mass concrete in bridge piers and abutments.

A.C.I. awards were presented to six men for outstanding work in the concrete field (see ROCK PRODUCTS, March, 1952, page 58).

Airfield Pavements

A SYMPOSIUM on "Airfield Pavements for Jet Aircraft," sponsored by the U.S. Naval Civil Engineering Research and Evaluation Laboratory, is being held this month, April 17-18, at Port Hueneme, Calif.

Topics to be presented include: definition of the problem; Air Force requirements; investigationl program of U.S. Army; British approach to problem; early planning and explorator

tests; Navcerelab's program; trends in aircraft design; modernizing existing airfield pavements; concrete design; and bituminous design.

Each topic presentation will be followed by a discussion which will be presented by representatives of the Civil Aeronautics Administration; air installations offices of several Air Force bases; public works offices of various Naval air stations; Naval District public works offices; and the Royal Canadian Air Force.

Safety Meeting

EASTERN NEW YORK Mineral Aggregates Safety Council met at the DeWitt Clinton hotel, Albany, N.Y., for its general meeting, February 27. Speakers at the meeting included B. T. Mangano, attorney, Laverack & Haines, Inc., Albany, who presented a report on various activities in the legal department, pertaining to health and accident cases and presented information on legislation regarding New York compensation laws and figures pertaining to costs in various states as compared to New York.

C. A. Gustafson, representative and chairman of the National Crushed Stone Association's accident prevention committee, gave a report on accidents reported throughout the industry. He particularly stressed accidents causing back and eye injuries, which seemed to be the most serious and most often sustained by workers. An N.C.S.A. report of a fatal accident occurring while cleaning out a screenings bin was also discussed. In relation to this accident, comments were given concerning working from the bottom of the bin with propane gas torches and the use of gas torches as against other kinds when working in confined places. Mr. Gustafson urged members to give more complete information when making accident reports to the N.C.S.A.

A. B. Hoftiezer, safety supervisor, Laverack & Haines, Inc., concluded the meeting with the showing and discussion of slides, depicting various plant hazards.

N.L.A. Golden Jubilee

NATIONAL LIME ASSOCIATION will celebrate its 50th year of continuous existence at a "Golden Jubilee" convention at The Homestead, Hot Springs, Va., May 8-10, 1952.

The convention program will feature a dramatization of the history of the American lime industry and the National Lime Association. One dramatization will be in the form of a Golden Jubilee souvenir brochure, authored by the N.L.A. staff; another will be a playlet, written by Nathan C. Rockwood consulting editor of ROCK PRODUCTS. The playlet will portray an N.L.A. board of directors meeting of 45-50 years ago, with the cast consisting of lime manufacturers.

A number of the old-time leaders of the industry will be in attendance, including Charles Warner, former

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president of Warner Co., Philadelphia, Penn., former president of N.L.A. (serving in this capacity for nine years), and the only living charter member of N.L.A. Another "old-timer" and former N.L.A. president who will be in attendance is George B. Wood, former president of Rockland-Rockport Lime Co., Rockland, Maine. Messrs. Warner, Wood and Rockwood have all agreed to reminisce about the past on the convention program.

Dr. Kenneth McFarland, considered by many as the most enjoyed speaker in the U.S. today, will be one of the main speakers. As stated by N.L.A., Dr. McFarland is a "real 'stemwinder' with a terrific sense of humor."

Other convention speakers will include Walter H. Acheson, chief, Building Materials Branch, Office of Price Stabilization, who will speak on O.P.S. regulations; J. Milton Cooper, N.L.A. legal counsel on percentage depletion; Harold Montag, director, Mining Machinery Division, National Production Authority, on priorities; a speaker from A. J. Boynton & Co., firm of consulting metallurgists, on the injection of pulverized quicklime in the tuyeres of the blast furnace; Professors Walter C. Voss and J. A. Murray of M.I.T., on their fundamental research on lime; and Roland F. Smith, N.J. Division of Fish and Game, on neutralization of lakes and ponds.

International Symposia

THE PORTLAND CEMENT ASSOCIATION Fellowship at the National Bureau of Standards, Washington, D.C., has announced that two international symposia are to be held this year, each in a foreign country. The first, an "International Symposium on the Reactivity of Solids," will be held in Gothenburg, Sweden, June 9-13, under the sponsorship of the Royal Swedish Academy of Engineering Sciences and the Chalmers' University of Technology. Additional information may be secured through the Symposium Information Bureau, Chalmers University of Technology, Gibraltargatan 5 J, Gothenburg, Sweden.

The second symposium, on "Chemistry of Cements," will be held at the Royal Institution of Great Britain in London, England, September 15-20, under the sponsorship of the Department of Scientific and Industrial Research and the Cement and Concrete Association of England. Information can be obtained through the Secretary of the Symposium, 52 Grosvenor Gardens, London S.W.1., or R. H. Bogue, National Bureau of Standards, Washington 25, D.C.

Liming Materials

"LIME COMES FIRST" was the subject of a speech given by Dr. Samuel R. Aldrich, extension agronomist, Cornell University, at the special farm program, "Town and Country Days,"

held April 1-3, at the University of Vermont. Dr. Aldrich, one of the most outstanding soil specialists in the Northeast, reviewed recent research on lime and liming materials, advised the farmers how and in what quantities to apply them, and discussed other problems relating to soil management, crop production and pasture improvement.

Steam Tempering

(Continued from page 142)

completely slaked out, it thus being possible to envisage the production of a cement whose expansion (as determined by the Le Chatelier test) is practically zero, irrespective of the free lime content of the cement. The great value of such a constant volume cement hardly needs any elaboration, particularly in view of the existing thoroughly unsatisfactory position regarding unsoundness in cement.

Present-day opinion on the subject can be summed up as a reiterated affirmation that well-burned clinker should not contain any free lime. This text book dictum for the production of an ideal cement cannot be expected to be satisfied always. In spite of the improvements in burning technique, and refinements in preparing the raw mix, it is obvious that in a continuously operating unit like the rotary kiln, occasional upsets and consequent falling off in the quality of clinker produced are inevitable. Further, many cement plants do not have satisfactory arrangements for the segregation and separate storage of underburned clinker, so that some intermingling of good and poor grade clinker is practically unavoidable.

Since the bogey of unsoundness in cement due to unslaked free lime will now be removed, the way is opened up for the manufacture of very high early strength cements (with much higher C_3S contents than are common at present). It is not suggested by any means that less attention be paid to proportioning and burning of raw materials. But, as the upper limit of the lime ratio is closely approached, the avoidance of formation of free lime is naturally rendered more difficult.

It would be useful in this connection to introduce a maximum limit for the free lime content of a cement (say 3 percent for standard and 4 percent for rapid hardening cements). Present-day specifications seem to have fought shy of taking this step because the actual free lime content of a cement, as determined by extraction methods, is not necessarily a measure of the degree of its unsoundness. If controlled tempering of cement were to come into general use, the laying down of a maximum free lime content will serve, not as an indication of unsoundness in cement, but as a further means of determining whether the proportioning and burning have been satisfactory. Correspondingly, the maximum allowable expansion can be reduced. For in-

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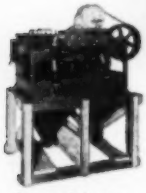
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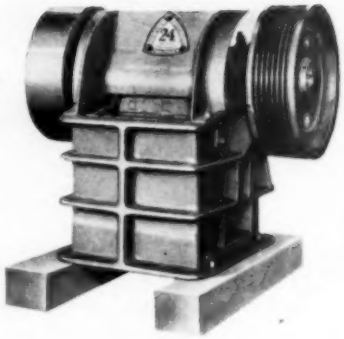
10" x 36"	21" x 36"
15" x 24"	21" x 40"
15" x 36"	25" x 40"
18" x 24"	32" x 40"



Specifications: Cast steel or fabricated steel frame. Cast steel bumper. 13%-14% Manganese steel jaws and cheek plates. Forced Feed crushing action. Safety toggle of cast iron protects against tramp iron.

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WILFLEY centrifugal PUMPS

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stance, the present maximum of 10 mm. allowed by the B.S.S. for the Le Chatelier test can be easily reduced to 5 mm.

Slaking out of MgO. Slaking out of the uncombined MgO content of a cement, as already pointed out, is within the range of achievement of steam treatment. High magnesia cements, because of their liability to exhibit delayed expansion, are at present disqualified for use in certain special processes—for instance the manufacture of precast units, where the hardening is accelerated by curing in an atmosphere of steam under pressure. This disability can possibly be removed through steam tempering.

Resistance to action of CO_2. Exposure to CO_2 (as during aeration or exposed storage) is known to affect the setting behavior of cement, an accelerated setting taking place. Because of their greater reactivity, finer cements are particularly liable to be affected. Steam treatment has been shown to increase resistivity to this action.

From the above discussion it will be seen that steam treatment is particularly beneficial for cements of extreme fineness and high C_3S contents. Both these factors are characteristics of rapid hardening cement. Along with its high early strength characteristic, there are a number of accompanying objectionable features (setting time difficulties, high heats of hydration, tendency for shrinkage, poor durability of resulting concrete, etc.), which at present are regarded as unavoidable. It would be interesting to investigate to what extent the performance of fine-ground cements can be improved by resorting to steam treatment (preferably on cement prepared from air-quenched clinker).

There are two further points regarding controlled steam tempering that require mention.

While it has been reported that the size of the MgO (periclase) grains are noticeably smaller in the case of air-quenched clinker, the writer has not been able to find any references on the grain size of other clinker compounds. If, in particular, C_3S and CaO grain sizes are on the smaller side in air-quenched clinker, then quickly cooled clinker should be more readily tempered than the corresponding slowly cooled clinker.

With respect to false set, if it be considered due to dehydration of gypsum,* then steam treatment of ground portland cement will afford an opportunity for the rehydration of any hemihydrate that is formed.

Conclusion

The clinker produced at the high burning temperature of the kiln is not in an "equilibrium" condition. This fact is shown up in an exaggerated form by the behavior of very finely ground cements. Their extreme susceptibility to storage conditions and

*While the phenomenon is as yet but imperfectly understood, most investigators in the field mention the partial dehydration of gypsum as the commonest cause of false set.

frequent exhibition of setting time abnormalities are indications not merely of extreme reactivity (in the sense of rapid hydration of such cement pastes), but also of their essential "disequilibrium." This latter fact seriously interferes with a fine cement's potential usefulness. Controlled tempering offers a simple, impressively effective means of achieving this necessary tempering.

References

1. Davis, A. C., "Portland Cement," 1934, page 321.
2. Searle, A. B., "Limestone and Its Products," 1935, page 492.
3. Bogue, R. H., "The Chemistry of Portland Cement," 1946, page 105.
4. *Ibid*, pages 104-105.
5. *Ibid*, synopsis of experiments by Lerch, page 128.
6. *Ibid*, page 128.
7. *Cement and Lime Manufacture*, January, 1951, page 517.
8. Blanks, R. F., and Gilliland, J. L., "False Set in Portland Cement," *Journal of the American Concrete Institute*, March, 1951, page 517.
9. Bogue, R. H., "The Chemistry of Portland Cement," 1946, synopsis of Lerch's experiments and conclusions, page 441.

Pennsylvania Gravel Meeting

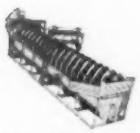
PENNSYLVANIA SAND AND GRAVEL Producers' Association held its annual meeting, March 11, at the Penn-Harris hotel, Harrisburg, Penn.

The following officers were re-elected: J. P. Eyre Price, Wyoming Sand & Stone Co., Scranton, Penn., president; William S. Giles, Iron City Sand & Gravel Corp., Pittsburgh, Penn., vice-president; and H. Hershey Miller, engineering representative, Harrisburg, Penn., resident engineer. Mr. Miller also succeeds Ray Warren as executive secretary. Mr. Warren had asked to be relieved of his duties as both secretary and treasurer, offices he has held for the past 15 years, explaining that his health required relinquishing some of the work which he has been performing. E. K. Davison, J. K. Davison & Brother, Pittsburgh, Penn., was elected treasurer.

Re-elected to the executive committee were Alex Foster, Jr., Warner Co., Philadelphia, Penn.; J. Allen Heim, Lycoming Silica Sand Co., Montoursville, Penn.; Charles A. Smith, Oil City Sand & Gravel Co., Oil City, Penn.; and L. P. Struble, Jr., Dravo Corp., Keystone Division, Pittsburgh, Penn. H. F. Rath, The Buffalo Slag Co., Inc., Buffalo, N.Y., was elected to the committee, replacing C. S. Wicker, recently deceased.

Among the topics discussed at the meeting were the proposed changes in the aggregate gradations requirements of the Pennsylvania Department of Highways. After lengthy discussion, it was resolved that any member having objections to the proposed new gradings should file his objections with Hershey Miller, resident engineer. Such objections will later be considered by the technical committee and discussed with representatives of the highway department. Karl F. Chapel, J. K. Davison & Brother, Pittsburgh, Penn., is chairman of the technical committee.

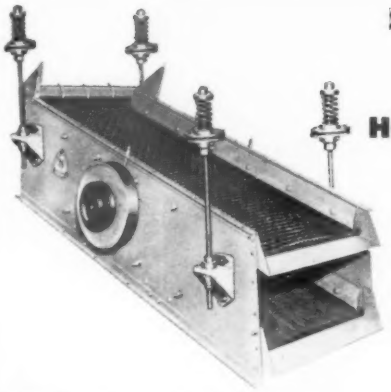
Denver "Sub-A" Flotation


Denver Cross-Flow Classifiers

Denver Hydroclassifiers

Denver Super-Agitator and Conditioners

DENVER-DILLON Vibrating Screens



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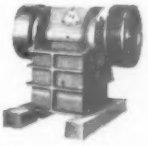
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Notice, on Denver-Dillon Vibrating Screens, that bearings are not anchored to heavy channel iron or other supports. Weight of screen and load is suspended. Bearings support only weight of flywheels and shaft. Screen is free of restrictions to impart maximum vibration to entire screen body.

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C-30—The ideal electrode for building up wearing surfaces which must later be machined. Weld metal deposit will average 215 BHN (R_B 96) which gives much greater wear resistance than mild steel deposits. Weld is completely free of pinholes, slag traps, or heat checks and machines readily. Recommended for shaft build-up, steel mill pods, spindles, back-up chucks, and other similar applications.

HARD DEVIL—For economical build-up, this straight high carbon type of electrode gives smooth beads, low spatter loss, easy slag removal with a hardness of 255 to 400 BHN, dependent on base material. For building up Car Wheels, Tractor Shoes, Conveyor Equipment, Crusher Rolls, Gear Teeth, etc.

RAILENDER—For the repair of battered rail ends, Railender gives a dense, homogeneous deposit with an excellent bond to the rail. The weld shows a hardness of about 300 BHN, which gives long service life. Weld beads are smooth, even, and flow together well, requiring a minimum amount of finishing.

WEAR DEVIL C—Excellent for build-up on parts which require a balance between wear and wear resistance such as track links and rollers used in earth-moving equipment. Hardness of the deposit is 300 to 320 BHN as welded. Wear Devil C has excellent arc stability, low spatter, and deposits smooth welds in any position.

TOUGH DEVIL—Champion High Manganese Electrodes (11-13% Manganese) are available in two types: No. 1, bare or coated, contains 3½% Nickel, and No. 2, bare or coated, is stabilized with Molybdenum. Deposits average 10 to 20 R_c as welded and will work harden to 52 R_c. Tough Devil Electrodes are used for the repair of manganese castings, build-up of frogs and crossings, dipper teeth, etc.

WEAR DEVIL A—An excellent alloy, all-purpose hard surfacing electrode, useful in all positions on applications requiring a hardness of 495-555 BHN (50-56 R_c). Deposit shows excellent resistance to abrasion and moderate impact. Wear Devil A Electrodes have very good arc stability on both AC and DC, low spatter loss, easy slag removal and deposit smooth, even beads. Recommended for rock-crushing equipment, dipper teeth, bucket lips, grappling hooks, agricultural machinery, gears and pinion teeth and many others.

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FINANCIAL

RECENT DIVIDENDS

American Rock Wool Corp.—Q	$ .20	Apr. 10
Bessemer Limestone & Cement Co.	.50	Mar. 13
Bessemer Limestone & Cement Co.—Pf.	.50	Apr. 1
Calaveras Cement Co.	.25	Mar. 15
General Portland Cement Co.	.50	Mar. 31
Ideal Cement Co.—Q	.50	Mar. 31
Lone Star Cement Corp.—Q	.35	Mar. 29
Marquette Cement Mfg. Co.	.20	Mar. 5
National Gypsum Co.—Q	.35	Apr. 1
Pacific Coast Aggregates, Inc.	.10	Mar. 10
Penn-Dixie Cement Corp.	.40	Mar. 14
Standard Silica Corp.—Q	.12½	May 15
Superior Portland Cement, Inc.	.25	Mar. 10
United States Gypsum Co.—Q	1.00	Apr. 1
United States Gypsum Co.—Q—7% Pf.	1.75	Apr. 1
Whitehall Cement Mfg. Co.—Q	1.00	Mar. 31

BLUE DIAMOND CORP., Los Angeles, Calif., for the years ended December 31, reports the following income account:

	1951	1950
Net sales	$14,969,495	$12,989,331
Costs & exp.	11,979,346	10,051,644
Deprec. & deplet.	511,364	508,158
Net earnings	2,478,785	2,429,529
Other income	30,674	72,893
Total income	2,509,459	2,502,422
Interest, etc.	9,440	17,014
Federal income tax	1,220,000	1,017,000
Excess profits tax	230,000	123,000
Net income	1,050,019	1,345,408
Earn., surp., 1-1	4,092,890	3,476,795
Dividends	583,450	729,313
Earn. surp., 12-31	4,559,459	4,092,890
Earned per share	$1.44	$1.84
No. of shares	729,313	729,313

BASIC REFRACTORIES, INC., Cleveland, Ohio, reports a net profit of $536,942, or $1.53 per common share on 350,000 shares, for the years ended December 31, 1951. This compares with a net profit of $813,625, or $2.32 per share for the preceding year.

MEDUSA PORTLAND CEMENT CO., Cleveland, Ohio, for the years ended December 31, has reported the following statement of income:

	1951	1950
Net sales	$20,218,598	$17,172,740
Cost of sales	12,972,815	10,958,333
Selling, etc., exp.	2,019,570	1,895,544
Deprec. & deplet.	1,017,686	889,756
Oper. profit	4,208,527	3,429,107
Other income	65,134	41,012
Total income	4,273,661	3,470,119
Interest	24,070	3,049
Can. exch. adj.		cr 7,371
Other deductions	16,194	9,088
Federal income tax	2,029,200	1,401,500
Excess profits tax	615,000	227,000
Other income tax	129,000	68,500
Net profit	1,460,197	1,758,353

SUPERIOR PORTLAND CEMENT, INC., Seattle, Wash., has reported a net income of $557,959 for the year ended December 31, 1951, as against $446,240 for the previous year. This amounted to $4.11 per common share, on 135,854 shares for the 1951 period, and $3.28 per share for the 1950 period. Net sales for 1951 totaled $6,372,637, compared with $5,513,515 for the preceding year.

PACIFIC COAST AGGREGATES, INC., San Francisco, Calif., reported a net profit of $803,174, or $1.01 per share, for the year ending December 31, 1951, which compares with a net profit of $732,908, or $0.91 per share for the preceding year. Sales for 1951 totaled $17,130,156, as against $15,636,107 for 1950.

MANUFACTURERS NEWS

Cummins Engine Co., Inc., Columbus, Ind., announces the appointment of E. D. Tull as vice-president for personnel and plant. Formerly manager of manufacturing, Mr. Tull in his new position will be responsible for all personnel activities and plant construction and maintenance.

The Colorado Fuel & Iron Corp., New York, N.Y., has announced the election of Alwin F. Franz as president of the company. He succeeds Carl W. Meyers, who has been elected vice-chairman of the board of directors. Mr. Franz has been executive vice-president since 1949, and a director since 1948. Prior to that, he served as vice-president in charge of operations. Until 1945 he was general superintendent of the steel division of Alan Wood Steel Co.

Alwin F. Franz

Chain Belt Co., Milwaukee, Wis., announces that J. Walter Snavely, manager, conveyor section, conveyor and process equipment division, recently gave a talk before the Engineers Club of St. Louis, Mo. The subject of his talk was engineering problems encountered in belt conveyor transportation development.

Western Precipitation Corp., Los Angeles, Calif., has opened a district office in Atlanta, Ga., under the direction of Kenneth H. Cree, to serve the territory comprising Georgia, Tennessee, Mississippi, Alabama, Florida and eastern Louisiana.

Bailey Meter Co., Cleveland, Ohio, has appointed W. Powell, Jr., as manager of the branch office in Buffalo, N.Y. He succeeds H. T. Sawyer, who has resigned to accept a position with R.C.A.

Lee Rubber & Tire Corp., Youngstown, Ohio, announces that Alfred W. Crew has joined the Republic Rubber Division as a field engineer. Formerly with Joy Manufacturing Co., Mr. Crew will make his headquarters in Charleston, W. Va. Karl H. Dressel has been appointed field engineer in the St. Louis, Mo., office.

Dewey & Almy Chemical Co., Cambridge, Mass., announces that Robert T. Haslam has been elected a member of the board of directors. Mr. Haslam is president of the United States Pipe Co.

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Lima, Ohio, announces the appointment of R. W. Head as district manager of the Southwest territory, which comprises New Mexico, Oklahoma and Texas.

The 3/4 cu. yd. Sauerman Power Scraper pictured above keeps screening plant supplied with material that it scoops out of a wide bank of gravel. Cost is under 10c for each cubic yard of gravel handled.

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When you own a Sauerman Drag Scraper you can tackle any job of gravel excavation, stripping, stockpiling and similar work with the assurance of producing big output at minimum expense.

A Sauerman scraper digs a heaping load, hauls this load to any point within its operating radius, dumps automatically, then returns at high speed to dig another load.

Operation and Upkeep Are Simple . . .

The operator of a Sauerman Scraper has control of everything at his fingertips. Any workman is easily trained for the job. Power consumption is small. Installation and upkeep costs are low.

Sauerman scrapers have been "tops" in the field of long range excavators for over forty years. Whether you buy one of our smallest machines or one of our largest, you obtain an expertly engineered unit guaranteed to take care of your particular work economically and to give you long, trouble-free service.

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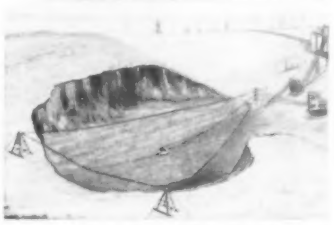
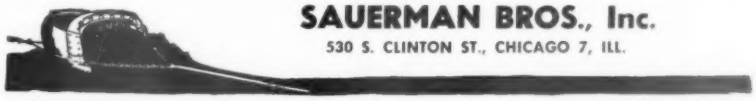
Small Sauerman scraper handles seasonal storage of 30,000 tons of surplus output annually at crushing plant, piling the surplus material in a single long pile and later reclaiming to a car-loading hopper.



HILLSIDE EXCAVATION

This picture shows how a Sauerman scraper digs into a hill of hard-packed glacial gravel and moves the gravel to a crushing and screening plant.



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- **REDUCTION OF "BREAKS" IN SCREEN**
- **BUILT AND DESIGNED WITH EXPERIENCED "KNOW HOW"**
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He succeeds R. A. Otterness who has accepted the position of sales manager for Contractors Equipment & Supply Co., Lima distributor in Albuquerque, N.M.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has appointed Edward B. Greef, formerly application and plant design engineer in the processing machinery department, as a sales representative in the San Francisco district office.

Olin Industries, Inc., East Alton, Ill., announces that Dr. Fred Olsen has been appointed vice-president for research and development. He is also a director of the company and has been the director of research and development.

Davey Compressor Co., Kent, Ohio, has appointed A. H. Knief as regional manager, with headquarters in Milwaukee, Wis., for sales in Wisconsin, Upper Michigan, Minnesota, Iowa, Illinois and Missouri.

Worthington Pump & Machinery Corp., Harrison, N.J., announces that Herman H. Miller has retired after 50 years of service with the company. He has been manager of the compressor division since 1932.

Dravo Corp., Pittsburgh, Penn., announces the sudden death on February 3 of Walter P. Berg, vice-president and director. He was 60 years old and had been associated with the company for 30 years. Mr. Berg was also a member of the executive committee and general manager of the machinery division.

Bemis Bro. Bag Co., St. Louis, Mo., announces that C. W. Loomis, vice-president and director of personnel, has been elected a member of the board of directors, and F. V. Deaderick, Eastern director of sales, has been named a vice-president.

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Division, Lima, Ohio, has appointed Bob Drumm, Louisville, Ky., as representative in Kentucky, southern Ohio and West Virginia. Cleveland Contractors' Equipment Co., Cleveland, Ohio, has been appointed sales agent in northeastern Ohio.

E. D. Bullard Co., San Francisco, Calif., has announced the appointment of Paul W. O'Donnell as industrial relations manager.

Broderick & Bascom Rope Co., St. Louis, Mo., announces that David Larkin, former executive vice-president, has been elected to the board of directors. A. A. Grosse, who has been assistant treasurer, has also been elected secretary to succeed Joseph H. Bascom, new executive vice-president and treasurer.

Blaw-Knox Co., Pittsburgh, Penn., announces the retirement of Chester H. Lehman as executive vice-president after 42 years of continuous service. He will continue to serve as a director and vice-chairman of the board.

Westinghouse Electric Corp., Pittsburgh, Penn., has announced the election of Robert D. Blasier and John E. Payne as vice-presidents. Mr. Blasier has been named vice-president in charge of industrial relations to succeed Tom Turner who has been appointed vice-president in charge of the motor and control division at Buffalo, N.Y. Mr. Payne, who has been manager of the Central district, becomes vice-president in charge of the district. T. I. Phillips, who has been head of the East Pittsburgh divisions, succeeds Mr. Turner as staff vice-president in charge of manufacturing.

Chase Bag Co., Chicago, Ill., has announced the retirement of W. L. Patrick, sales representative for the past 33 years, with headquarters in Boise, Idaho, and the appointment of R. F. Rhoden to succeed him.

Gar Wood Industries, Inc., Wayne, Mich., has announced the appointment of William H. McAllister as district manager of the Texas, Oklahoma and New Mexico territory of the Findlay division. He was formerly district manager at Memphis and will be succeeded by Guilford E. Koehler, a district manager for the Findlay division.

Olin Industries, Inc., New York, N.Y., announces the appointment of F. S. Elfred as executive vice-president, B. E. Bassett as vice-president for production, and M. W. Acker as a vice-president. All are directors of the company.

Thermoid Co., Trenton, N.J., has appointed A. F. Matheis as assistant sales manager of industrial rubber products. He was formerly sales promotion manager of the industrial rubber products division.

The Frank G. Hough Co., Libertyville, Ill., announces the appointment of Milton J. Weber as vice-president of procurement.

Blaw-Knox Co., Pittsburgh, Penn., has announced the appointment of Arthur A. Levison as vice-president and general sales manager of the Blaw-Knox division. He was formerly a division vice-president in charge of the construction equipment department. H. Russell Loxterman has been appointed assistant general sales manager of the division in addition to his duties as manager of the steel plant equipment department.

Arthur A. Levison

American Brake Shoe Co., New York, N.Y., has announced the appointment of W. Frank Kelly as assistant vice-president, and John E. Holtman as general superintendent of foundries of the American Manganese Steel Division.

Baughman Mfg. Co., Inc., Jerseyville, Ill., recently dedicated the latest addition to its plant at Jerseyville. The new building adds 16,000 sq. ft. of floor space to the plant which now comprises 100,000 sq. ft. of manufacturing, assembling and storage facilities.

The Hays Corp., Michigan City, Ind., has announced the appointment of Phil Sprague, Jr., as executive vice-president. He was formerly advertising manager and will be succeeded in this position by Paul B. LeBoeuf, formerly of A. O. Smith Corp.

The Fahralloy Co., Harvey, Ill., announces that A. Rasmussen has been appointed vice-president and plant manager, and Robert E. Kroc, formerly assistant sales manager, succeeds him as sales manager.

Iowa Mfg. Co., Cedar Rapids, Iowa, announces that Henry J. Adams, sales engineer, has resigned to assume ownership and operation of Cunningham-Ortmayer Co., distributor of Milwaukee, Wis. As a new distributor, still operating under the name of Cunningham-Ortmayer, Mr. Adams will continue to serve the entire state of Wisconsin with leading lines of construction and road-building equipment. Sales and service headquarters will remain at 1229 S. 41st St., Milwaukee, with a branch in Green Bay, Wis.

Henry J. Adams

Traylor Engineering & Mfg. Co., Allentown, Penn., announces that Paul A. Schrefflер, formerly a student engineer with Allis-Chalmers Mfg. Co., has joined its staff of sales engineers.

Sterling Electric Motors, Inc., Los Angeles, Calif., has announced the opening of a new district office in Denver, Colo., and the appointment of James R. Hughes as district manager.

Industrial Gear Mfg. Co., Chicago, Ill., has announced the election of J. A. Sizer as president of the company. He was formerly vice-president in charge of sales and succeeds A. M. Scharek, founder of the firm, who was elected chairman of the board and chief executive officer.

Gould-National Batteries, Inc., Trenton, N.J. has appointed George F. Walsh as sales promotion manager. For the past four years he held a similar position with Baldwin-Lima-Hamilton Corp. at Eddystone, Penn.

Allis-Chalmers Mfg., Co., Milwaukee, Wis., announces that Russell G. Michell, an application engineer in the crushing, cement and mining section since 1950, has been appointed a sales representative in the Boston district office of the general machinery division.

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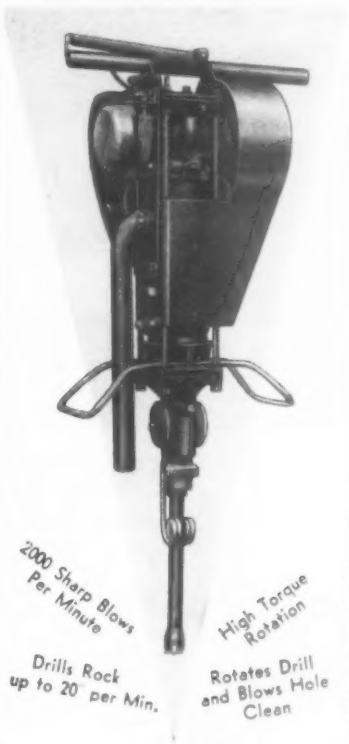

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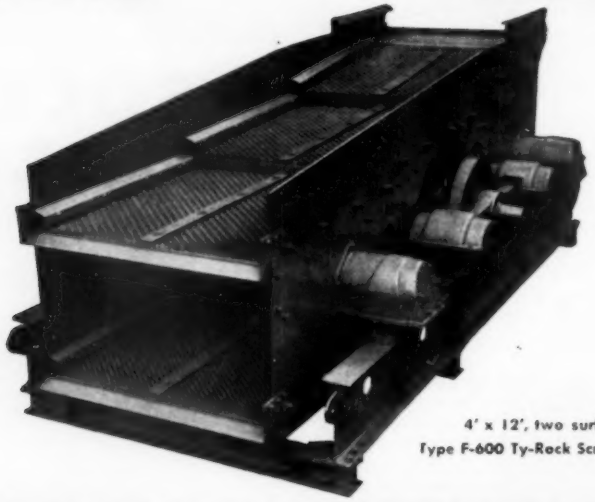

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- Repairs made with MANGANAL and protected by SEACO often outlast new parts.
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Try a 50 lb. box of SEACO. If it doesn't do everything we say . . . return the unused portion to us for an immediate refund.

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SOLE PRODUCERS
92 N. J. Railroad Ave.
Newark 5, N. J.

General Electric Co., Schenectady, N.Y., announces that Carl A. Salmonsen has been appointed general manager of the industry control department of the switchgear and control division.

Oliver United Filters, Inc., New York, N.Y., announces the appointment of James B. Hoxie as Western division sales manager, with headquarters in Oakland, Calif. His territory takes in all the Mountain and West Coast states. Mr. Hoxie, who has been with the company for 20 years, succeeds Philip J. McGuire who has been appointed director of research and development. Mr. Hoxie is familiar with both sales and manufacturing, having spent about ten years in the company's Central sales division territory, working out of Chicago, and ten years in the factories.

James B. Hoxie

The Frank G. Hough Co., Libertyville, Ill., has appointed Carl W. Tuohey as representative for the sales district comprising the states of New York, New Jersey, Pennsylvania, Virginia, Delaware, West Virginia and New England. He succeeds William Cornell who has been recalled to active service with the Marines.

Atlas Powder Co., Wilmington, Del., has announced the election of William J. Wiley as a member of the board of directors and as financial vice-president.

Quaker Rubber Corp., division of H. K. Porter Co., Inc., Philadelphia, Penn., has established a branch warehouse and sales office in St. Louis, Mo., under the supervision of J. H. Joyner, district sales manager.

Detroit Diesel Engine Div., General Motors Corp., Detroit, Mich., has appointed James A. Hall as chief project engineer. He was formerly engineer in charge of Series 110 engine development.

Gar Wood Industries, Inc., Wayne, Mich., has announced the appointment of W. A. Glimn as director of purchases to succeed C. M. Strong, who passed away February 23. W. C. Robertson, formerly vice-president for export, has been named vice-president in charge of government sales and regulations. E. B. Hill, formerly vice-president in charge of domestic sales, has been appointed vice-president of domestic and export sales.

Chase Bag Co., Chicago, Ill., has transferred Eugene P. Alexander, sales representative, from Cincinnati to the Detroit sales office. D. L. Herrick, formerly of the Milwaukee branch, succeeds Mr. Alexander at Cincinnati.

Pangborn Corp., Hagerstown, Md., announces the appointment of Arthur J. Buckley as assistant sales manager. For the past 11 years, Mr. Buckley has been associated with the Harnischfeger Corp., Milwaukee, Wis.

Sterling Electric Motors, Inc., Los Angeles, Calif., has opened a sales office in New Orleans, La., with J. D. Trice as manager.

Link-Belt Co., Chicago, Ill., has appointed Raymond S. Wood as general manager of the ball and roller bearing plant (Dodge plant) in Indianapolis, to succeed C. V. Loughery who has retired after 50 years of service at the Philadelphia and Indianapolis plants.

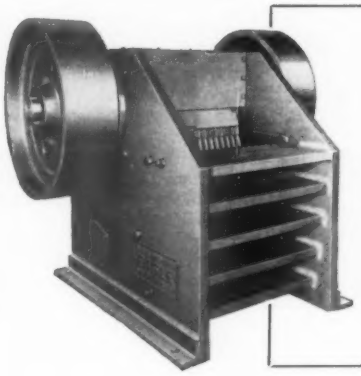
Diamond Iron Works, Inc., Minneapolis, Minn., announces that Robert A. Slenes has been appointed export sales manager for the company and also the Mahr division, which manufactures crushing and processing equipment.

Fruehauf Trailer Co., Detroit, Mich., announces the appointment of Ray Stutzman as manager of the St. Paul, Minn., branch, which covers Minnesota, North Dakota and the northwest portion of Wisconsin. He was formerly branch manager at Sioux Falls, S.D., and will be succeeded in this position by Thomas Cartee, formerly branch manager at Sioux City, Iowa. Mr. Cartee's territory covers South Dakota, northern Iowa and the southwest tip of Minnesota. L. B. Shettle has been appointed branch manager at Sioux City, Iowa, which covers western Iowa, southern South Dakota and northern Nebraska. He was formerly sales manager at Omaha, Neb.

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Lima, Ohio, has appointed James A. McCrae as sales and service engineer for the states of Colorado and Wyoming with the exception of the following counties in Wyoming: Sweetwater, Uinta, Lincoln, Sublette and Teton. He will make his headquarters in Denver.

Air Reduction Co., New York, N.Y., announces that Dale D. Spoor, who has been on leave of absence to serve as chief of the Industries Branch of the Metalworking Equipment Division of the National Production Authority, Washington, D.C., has returned to Airco as manager of the equipment and process sales department.

Worthington Pump & Machinery Corp., Harrison, N.J., has announced the election of C. K. Hood as a vice-president of the company. He was formerly manager of the New York district sales office and will be succeeded in this position by W. J. Van Vleck, manager of the Atlanta district sales office. C. W. Kramer, general line salesman in Birmingham, Ala., will succeed Mr. Van Vleck as manager at Atlanta. I. W. Leggett, general line salesman at Charlotte, N.C., has been appointed manager of the Charlotte branch office.



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Does a superior job! Extra heavy, one-piece electrically welded construction is simple—good for years. All wear parts are extra tough high manganese steel, reversible for double wear. Incorporates a number outstanding features described in folder #151-125, yours for the asking.

Comes in various sizes and models, including a roadside and trailer model for "on-the-spot" crushing. Write now for this folder.

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***Super Strength* Parts**
are "tops" for resisting
SHOCK • WEAR • ABRASION • BREAKAGE

← EVANSTEEL Heat-Treated Hammers have proved far superior to any other material for pulverizing purposes.

EVANSTEEL Dipper Teeth give extra long service even in digging the toughest material. →

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EVANSTEEL Wire Rope Sockets have had no recorded service failure in 40 years. →

For high-strength parts . . . for an *extra* margin of safety . . . for weight-saving sections . . . use dependable EVANSTEEL. This chrome-nickel alloy has a tensile strength after annealing that averages up to 60% greater than ordinary carbon steel.

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Kedzie Ave. & 37th St., Chicago 32, Ill.
Makers of Alloy Steel for Over 40 Years

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WEIGHTOMETER gives a continuous, automatic, and accurate weight record of materials in transit at an extremely low operating cost. All producers of bulk materials handled by belt conveyors need this dependable check on production figures supplied by MERRICK WEIGHTOMETER.

Send for Bulletin 375

Merrick Scale Mfg. Co.
Passaic, New Jersey

Union Bag & Paper Corp., New York, N.Y., has announced the appointment of Harry Recher as assistant to L. J. Doyle, vice-president in charge of bag and paper sales. He was formerly a field representative for multiwall bag sales.

Jackson & Church Co., Saginaw, Mich., announces that Francis W. Hoye, former head of the mechanical engineering departments at the University of Rhode Island and at Syracuse University, has been named director of engineering, and Dr. Harold E. Graves, who has been in charge of the chemical engineering department at the University of Rhode Island, will direct chemical engineering. Four other engineers who formerly were on the staffs of universities have joined the company. They are Ralph C. Emig, professor of engineering at Lawrence Tech; Michael T. George, Wayne University; Leonard M. Majeske, University of Detroit and Catholic University of America; and Frank H. Wheeler, DePauw University. In addition, Charles Lee Dong Chin and James F. Grove, both from the University of Rhode Island, have joined the staff of Jackson & Church.

W. P. Heineken, Inc., New York, N.Y., announces that A. Brickman, president of A. Brickman, Inc., exporters of chemicals and chemical process equipment, has joined the company as secretary-treasurer.

FARREL-BACON JAW CRUSHERS

SIZES 60" x 48" to 10" x 7"

Optional design features include: (1) Meehanite frame, sectionalized when necessary; (2) removable water-cooled bearings; (3) improved design of swing-jaw bearing; (4) force-feed oil lubrication, or circulating system if desired; (5) split flywheels; (6) flat or V-belt drive. *Write for further details or engineering assistance.*

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- ___Barges
- ___Batchers
- ___Belting, Conveyor, Elevator, Power Transmission
- ___Belting, V-Type
- ___Belt Repair Equipment
- ___Bin Level Indicators
- ___Bins and Batching Equipment
- ___Blasting Supplies
- ___Block Machines Concrete Building
- ___Bodies, Trailer
- ___Brick Machines and Molds
- ___Buckets
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- ___Cars, Industrial
- ___Classifiers
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- ___Concentrating Tables
- ___Concrete Mixers
- ___Concrete Mixing Plants
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- ___Diesel Engines
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- ___Draglines
- ___Dredge Pumps
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- ___Drills
- ___Dryers
- ___Dust Collecting Equipment & Supplies
- ___Electric Motors
- ___Engineering Service, Consulting and Designing
- ___Explosives & Dynamite
- ___Fans & Blowers
- ___Flotation Equipment
- ___Gasoline Engines
- ___Gear Reducers
- ___Generator Sets
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- ___Gypsum Plant Machinery
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- ___Pumps
- ___Scales
- ___Screen Cloth
- ___Screens
- ___Scrubbers: Crushed Stone, Gravel
- ___Shovels, Power
- ___Speed Reducers
- ___Tanks, Storage
- ___Tractors
- ___Trucks, Industrial
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- ___Trucks, Motor
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- ___Welding & Cutting Equipment
- ___Winches
- ___Wire Rope

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CONCRETE UNITS · READY-MIXED CONCRETE

New-type concrete block gives stone effect

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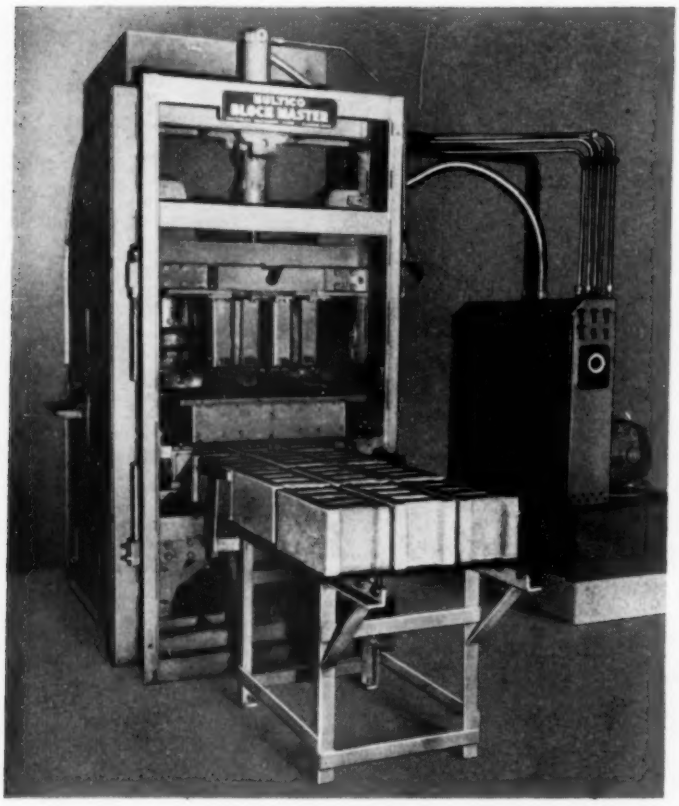
Blockmaster #3

High Production · Fully Automatic · Hydraulically Powered



The Multico Blockmaster No. 3 is now ready for *your* plant—after three years of production testing in many plants. Producing three blocks per cycle, it is a completely automatic machine, requiring labor only to offbear block. Hydraulic power from a separate unit provides smooth, quiet operation and serves additional machines in future expansion. The compression action combines pressure, vibration, and tamping, for perfect blocks. Plain pallets are used in making any size or style of block with any aggregate.

Both the Blockmaster No. 3 and the newly modified No. 2 have 50% less moving parts than any other machine in their capacity classes. This means an absolute minimum of maintenance.

Make this proven Blockmaster No. 3 your next machine; call or write for further information.

Multiplex Machinery Corporation has been making concrete production machinery for over 40 years. Our engineers will help you plan your plant expansion. We can show you how Multiplex automatic block machines, mixers, skip hoists, and compartment aggregate bins can make your operations more profitable.

MULTIPLEX MACHINERY CORPORATION

ELMORE • OHIO

INDUSTRY NEWS

Contest Promotes Use of Concrete Block

HAZARD CONCRETE PRODUCTS, INC., San Diego, Calif., is sponsoring a "Build a Hazard-Bloc Garden Wall Contest" to promote the use of concrete block in the building of homes and gardens. The contest is open to

... "build a HAZARD-BLOC
GARDEN WALL CONTEST"
GRAND PRIZE $200
Second Prize $100 Third Prize $50
PLUS SIX $25 PRIZES!
PLUS THREE $50 PRIZES OF THE MONTH!
ENTER NOW FOR MARCH 1st PRIZE
CONTEST RULES
JUDGES
HAZARD CONCRETE PRODUCTS, Inc.

Poster promoting garden wall contest

any San Diego county resident and prizes will be awarded for originality, usefulness, beauty and improvement of outdoor living area. The garden wall (or walls) may be built by the owner or professionally for the owner and must contain Hazard Bloc, used in any combination totaling at least 200 sq. ft. The company states that the contest idea has had a fine reception. Shown here is a reproduction of the ad, announcing the contest.

Curing Unit Installation

VIBRO TILE CO., INC., Victorville, Calif., recently installed a Pacific Universal concrete products curing unit for curing concrete, pumice and cinder block. Approximately 10,000 8- x 8- x 16-in. block per day are cured in a 30- x 70- x 8-ft. building which is divided into four rooms, each measuring 14 ft. 8 in. x 34 ft. 8 in. x 8 ft., with end-door openings having heavy canvas covers instead of regular doors.

The four curing rooms hold 6000 block on racks and the curing of the 10,000 block per day is accomplished by an overlapping shift. The first cure of the day, 4000 block, is run in 6 hr., and the second cure of 6000 block, in 6 hr.; however, the second cure is left in the curing room overnight with the blower in operation.

Block removed from the curing rooms in the first cure are stockpiled, but the block from the second cure that have been in the curing rooms overnight can be loaded and transported immediately. Normally, the heat and steam are on for only about 2½-3 hr., and for the balance of the time only the blower is run to keep up pressure and circulation of the heat. The cured block are said to be quite dry and have an approximate 1000 p.s.i. compressive strength.

Pacific Wire Belt Conveyor Co., Los Angeles, Calif., which made the installation, recommends concrete ducts whenever possible, as they are less expensive and claimed to be better than metal or fibrous ducts, because they have good insulating qualities and will last indefinitely since they are not affected by heat or moisture. However, ducts constructed from pumice or other lightweight aggregate concrete are considered more efficient than conventional concrete.

Cover Picture

A NEW TYPE CONCRETE block developed in Ohio provides a wall which closely resembles a masonry wall of natural stone of mingled sizes, shapes and colors. The effect, shown in the house on the cover, is obtained by forming concrete block in such a manner that the outer surface resembles rough hewn stone.

False mortar joints are formed in the outer surface of the block so as to give the appearance of several stones of different size and shape. The outer surface is then colored by solutions of metallic salts. These block are of the same general shape and construction as conventional units, either 8- x 8- x 16-in. cored units or 4- x 8- x 16-in. solid ones.

Known as "Art-Crete" block, the units were developed by Stephen H. Smith and John L. Kronsis, Canton, Ohio, and are being produced by Artcraft Blocks, Inc., in Canton.

The block can be produced on any conventional block machine; special die plates inserted in the molds give the surface pattern desired. A heating element across the face of the mold box prevents the concrete from sticking to the face of the die plate.

After removing from the molds, the block are placed in a kiln and cured for 12-15 hr. at about 150 deg. F. They are cured and dried before color is added to the surface.

Color is applied by a novel set-up. Two tanks containing coloring solutions have wood rollers covered with soft sponge rubber, partially submerged in the solution. Block are rolled back and forth over the rolls, the surface receiving a liberal coating of color solution. The block absorb the color to a depth of about 1 in.

The block have been used for numerous homes in the Canton area as well as several churches and service stations. The inventors state that franchises are now being offered to producers throughout the country.

ADRIAN READY MIX CONCRETE CO. is building a ready-mixed concrete plant at Adrian, Minn. The plant is expected to be in operation sometime this spring.

TERRY CARPENTER, former Nebraska congressman, has sold his concrete block plant at Scottsbluff, Neb., to Kenneth Datel, his former manager, who will operate the business in partnership with John Banks.

UNITED CONCRETE PIPE CORP., Baldwin Park, Calif., recently purchased the concrete pipe plant at Ephrata, Wash., from Collins Concrete and Steel Pipe Co. of Portland, Ore. United Concrete Pipe Corp.'s plant at Moses Lake, Wash., was closed down during some of the winter months, but is presently resuming operations. The plant is producing concrete pipe, 1-6 ft. in dia., for the Columbia Basin Reclamation Project.

CONSUMER READY-MIXED CONCRETE Co.'s new ready-mixed concrete plant at Moline, Ill., has been completed and will be in full operation this spring.

RIDDLE QUARRIES, INC., Marion, Kan., has expanded operations with the installation of a new ready-mixed concrete plant.

LOCK JOINT CONCRETE PIPE CO., East Orange, N.J., recently completed construction of a new plant at Columbia, S.C., for the production of prestressed concrete pressure pipe.

CONCRETE MASONRY MANUFACTURERS ASSOCIATION held a general membership meeting, February 26, 1952, at the Rodger Young Auditorium, Los Angeles, Calif. The program was primarily a business one, with reports being presented for discussion by the Building Standards and Code Committee, the Budget and Finance Committee and the Labor Committee.

CONSUMERS CO. has announced the removal of its general offices to 79 W. Monroe St., Chicago 3, Ill. The new address became effective March 1.

CONTRACTOR SUPPLY CO. is establishing a ready-mixed concrete plant at Pittsburg, Kan. The company's first project will be to supply concrete for the construction of Pittsburg's new sewage disposal plant. Vernon M. Cagle, Carthage, Kan., will be in charge of operations.

ROSS SAND CO., Concordia, Kan., is expanding operations with the addition of a concrete block plant which will produce approximately 2500 "Concord" block per day. The company, in addition to its sand and gravel operations, also produces septic tanks, lintels, soffit roofs, concrete sewer and culvert pipe and ready-mixed concrete. E. H. Ross is manager.

ADAMS CONCRETE PRODUCTS CO., Durham, N.C., has begun operations at its new $200,000 concrete block plant. The plant, which has been completed except for the construction of an office building, has a capacity of 8000 block or 96,000 brick per day.

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the BUSINESS END of a profitable operation

Challenge Mixers have everything you want . . . low first cost . . . minimum maintenance . . . lower repair and replacement cost . . . greater legal payload capacity . . . all rolled up into one.

From the day you take delivery of a Challenge Mixer you'll start a more profitable operation! (That's why more and more operators are standardizing on Challenge fleets.) Each size* Challenge Mixer is engineered to legally carry its full, rated-capacity payload . . . a feature especially important in states where weight laws are strictly enforced, and one that makes it possible to take full advantage of both the physical and legal capacity of your particular truck.

See for yourself why Challenge is the "business end" of a profitable ready-mixed concrete operation. Compare it with any mixer on your own job, with your own crew.

MEMBER NRMCA

Challenge Truck Mixers

Power Take-off installation optional. Data and prices on request.

*Challenge Mixers are made in six sizes:
3 - 3½ - 4 - 5 - 6 - 6½ cubic yard capacity

COOK BROS. EQUIPMENT CO. (C-P)
Please send name and address of nearest Challenge dealer where we can arrange an actual demonstration.

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COOK BROS. EQUIPMENT CO.

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Exclusive National Distributors for CHALLENGE, The Modern, Streamlined Truck Mixer

Concrete Masonry Industry Broadens Markets Into New Fields

Diversified program at N.C.M.A. meeting emphasized progress in manufacturing, technical methods, sales promotion and market expansion. Price stabilization, priorities, covered storage, curing, prestressing, merchandising and aggregates received attention

ATTENDANCE AT THE thirty-second annual convention of the National Concrete Masonry Association, held February 18-20 in New York City, totalled nearly 1100, which was excellent for a non-exhibit year. The association has now grown to a membership of 583, reflecting the great progress by the industry and the organization.

The program was well diversified, and papers and discussion developed that there continues to be great progress in manufacturing and technical methods, in sales promotion and market expansion. Retiring president Horace W. Bush led off the convention with his address and then followed the annual reports of the treasurer, the director of engineering, the director of promotion and the executive secretary.

The second session covered the subjects of price stabilization, availability of portland cement and reinforcing steel. Technical sessions under the chairmanship of George Mansfield, chairman of the technical problems committee, required an entire day. Among the subjects covered were a symposium on covered storage and methods of drying concrete masonry units, load tests of lintels, prestressed concrete masonry, control joints in masonry buildings, design details as a factor in the cracking of masonry walls, high pressure steam curing and soffit block floor systems.

The morning session of the third day, under the chairmanship of Philip Paolella, chairman of the publications and publicity committee, was a promotional meeting. Among subjects covered were masonry displays, promotion of concrete masonry floors in connection with radiant heating, and reports from officials of local, state and regional associations. Then followed the aggregate session, with S. Carl Smithwick as chairman. Following a paper on expanded shale production, there were separate aggregate meetings for those interested in the several commonly used aggregates.

Entertainment included the "El Rancho Party" through the courtesy of association members in the surrounding New York and New Jersey area, and the annual banquet with floor show and dancing. Special ladies' events consisted of a get-together tea, a breakfast in one of New York's leading department stores and a luncheon-fashion show at a leading hotel.

Officers

A. G. Streblow, president of Basalt Rock Co., Napa, Calif., was elected president of N.C.M.A., succeeding Horace W. Bush, Orange, N.J. In accepting the presidency, Mr. Streblow expressed great satisfaction in the growth of the industry and urged a continuing aggressive course of action in order to maintain the momentum already achieved.

He credited growth of the industry to group action, the courage to expand, the meeting of technological changes and the willingness to invest money in the gamble that is so essential to our free enterprise system. The ingenuity of machinery manufacturers in supplying automatic machines and appurtenances for high volume, low-cost production was singled out as an outstanding contribution to expansion of the industry. Mr. Streblow further emphasized that today's high capacity plants are a challenge to the resourcefulness of the industry in marketing and in furthering technical progress.

Much has yet to be accomplished,

Approximately 800 attended the N.C.M.A. banquet; variety acts and dancing were featured entertainment

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Left: President-elect A. G. Streblow, Basalt Rock Co., Napa, Calif., presenting certificate to N.C.M.A. retiring president Horace W. Bush, Multiplex Concrete Corp., Orange, N.J. Right: Three new directors elected for 5-year terms are, l. to r., W. A. Neff, Neff Concrete Products Co., Danville, Ill.; Leon K. Camp, Camp Concrete Products, Columbus, Ga.; and Earl W. Peterson, Ideal Cement Stone Co., Omaha, Neb.

he said, but greater goals are to be achieved through the unity represented in N.C.M.A. One of the things he has liked about affiliation with the association is the free and frank exchange of ideas which has contributed to the progress that has led to a unified industry of great strength.

Other officers elected were vice-presidents Herbert Geist, Geist Coal and Supply Co., Cleveland, Ohio; Sam Paturzo, V. Paturzo and Sons, Baltimore, Md.; and Lewis Lloyd, Alatex Construction Service, New Orleans, La. Carroll Strohm, Jr., Nashville Breeko Block and Tile Co., Nashville, Tenn., was re-elected treasurer.

Elected directors were L. K. Camp, Camp Concrete Products, Columbus, Ga.; W. A. Neff, Neff Concrete Products Co., Danville, Ill.; and Earl W. Peterson, Ideal Cement Stone Co., Omaha, Neb. Retiring members of the board of directors are Otto Buehner, Salt Lake City, Utah, and Cloyd Fellabaum, Toledo, Ohio.

Next year's convention and biennial Concrete Industries Exposition will be held in Cleveland, Ohio. The exposition will be centered in the Municipal Auditorium. The midyear meeting of the board of directors will take place June 23-24 at the Fairmount hotel in San Francisco, Calif.

President's Address

Following the invocation opening the convention on Monday, Horace Bush, Multiplex Concrete Corp., Orange, N.J., presented the president's address. The official gavel had been given him by the mayor of New York's representative, who welcomed the association to the city. Mr. Bush reported the latest changes on the association staff (two members had left for other positions) and the new Washington office approved by the board of directors.

The position of the concrete masonry industry must be maintained by product quality and improvement, Mr. Bush said. To this end he worked with the technical problems and the publications and publicity committees, both of which are doing an excellent job, he stated. The prospects for a market for concrete masonry in the housing program are quite good, he continued, since more housing must be built for the defense effort. Most housing will probably be delayed until the end of the year, though, in his opinion. He was very optimistic for 1952 nonetheless. Opportunities to expand markets by introducing new products and by improving production also contribute to his optimism. All producers should look for ways to make their production better and to do it with less cost and less manpower. All will be working under the threat of war, so industry must shoulder its responsibilities, he concluded.

Staff Reports

The executive secretary of the association, E. W. Dienhart, paid tribute to Mr. Bush and to all the past presidents for their efforts in making the N.C.M.A. of more value to the membership. His annual report brought out the information that there were 583 member companies in the association at the beginning of the year, representing a net addition of 68 new members and 16 associate members.

As an example cited of individualized service by the association, when one member had trouble in using bulk cement, a questionnaire was sent to other members. Mr. Dienhart reported the results, which in summary were: a clean car and accurate tare and scales are necessary for full loads of cement; producers should accept the railroad car tare stencil, but all should know what to do if it is light weight; if the tare is incorrect, make claim to the railroad for adjustment; if tare weight is not the trouble but shipments are incorrect, submit the information and the problem to the cement supplier.

It was unexpected that 1951 production would go above 1950, R. E. Copeland, director of engineering, stated in his report. Even though industry is now under controls, he looks for increased demand this year. Much demand comes from the military construction program. The Army Corps of Engineers, which has supervision over all military construction, at one time considered curtailing the use of concrete masonry materials because of alleged poor results. Mr. Copeland told how the N.C.M.A. and Portland Cement Association jointly undertook to show how construction methods could be improved and the advantages offered by concrete masonry construction. This resulted in the Corps of Engineers specifying concrete masonry for all permanent base construction. The Chief of Engineers obtained N.C.M.A.'s assistance in setting up standards and in preparing the Army manual "Design and Construction Procedures for Concrete Masonry Construction of Permanent Bases" (a copy of which was sent to N.C.M.A. members with Bulletin 194, according to Mr. Copeland).

Special requirements of the Army manual which should be noted by producers were listed by Mr. Copeland as follows: (1) the maximum moisture content of block must not exceed 30 percent of total absorption, though in special cases, to be decided by the C. of E., this may be increased to 35 percent; (2) requirements for acceptable types of units for constructing reinforced concrete masonry bond beams should be furnished by producers ready for use as an economy measure instead of cut from standard units by masons at the job site; and (3) the requirement that producers shall certify that concrete masonry units will be made, cured and dried in the "same or equally effective manner as were the samples on which acceptance was based."

Little criticism has been voiced by producers against the Army specifications, according to Mr. Copeland. Upholding the reputation of concrete masonry demands adherence to these requirements, he pointed out. To help producers meet specified moisture contents, a number of N.C.M.A. informational bulletins were issued during the past year. In addition, information which would help producers meet other Army specifications were sent to members, such as National Bureau of Standards report BMS 92, "Specifications for 4-hr. Fire Walls in Warehouses."

Other activities of the director of engineering included solving local problems of members, particularly

with regard to gaining acceptance of concrete masonry construction by government agencies.

Research undertaken during 1951 was described: a series of load tests of reinforced concrete masonry lintels was completed at the University of Detroit (under the direction of Prof. H. E. Mayrose) and a second series of lintel tests was outlined and started. Investigation of sound transmission of plain and painted concrete masonry partitions was started at the Riverbank Acoustical Laboratory of Armour Research Foundation. The first part of this work is scheduled for completion this summer, and includes tests of plain and painted partitions built of 4-in. hollow, 4-in. solid, 6-in. hollow and 6-in. solid units made with cinder and Haydite aggregates. The effect on sound impedance of applying one and two coats of portland cement and resin emulsion paints is being investigated.

Other work undertaken included tests of the effect on block strength of varying the mixer speed and length of the mixing period. The association assisted in planning and conducting a series of tests on a relatively new method of curing block with closely controlled injections of superheated steam into the curing room. Excellent block were obtained, Mr. Copeland said, in spite of the fact that the steam temperature as measured in the supply duct was over 500 deg. F.

Mr. Copeland reported the trend to poured basements and tilt-up wall construction. He suggested no clear-cut solution to these inroads on concrete masonry markets, though admitting that a more plentiful supply of masons would help. Furthermore, more efficient handling of masonry materials on the job could also help. Of course, he said, prefabricated concrete masonry, not only for floors and roofs but also for walls, has attractive possibilities for enlarging markets. The conference on prestressed concrete held last year at Massachusetts Institute of Technology had many references to precast units, Mr. Copeland said.

The accident prevention program, the speaker said, is suffering because of lack of interest. Too many producers are not reporting accidents and lost-time injuries to the association in accordance with the plan set up last year. Unless more interest is shown, Mr. Copeland warned, accident prevention as an activity of the association may have to be dropped.

The second largest item in the association's budget is for publications and publicity, reported William P. Markert, director of promotion. The program for 1952 will include the N.C.M.A. *Reporter* and also special publications, such as the previously issued church, school and residential construction booklets. These new publications will be on concrete masonry wall patterns, industrial constructon, basement construction, floor construction (containing the report of a heating consultant on radiant heating methods), and a booklet containing pictures of 60 outstanding examples of concrete masonry construction. These pictures are also available as giant prints and can be purchased by members.

More advertising was undertaken during the year, resulting in many inquiries to the main office, Mr. Markert said. Inserts are now placed in Sweet's File, both Architectural and Engineering. Space is also taken in the Producers' Council bulletin, which goes to A.I.A. architects.

Price Stabilization Rules

How price stabilization works and how the rules affect the concrete masonry industry was described by Edward J. Brunenkant, masonry materials section, Building Materials Division of National Production Authority, Washington, D.C. CPR 22, he said, covers all concrete masonry producers. There is an option which permits producers with gross sales of less than $250,000 to price under General Ceiling Price Regulation (with the base period of December 19, 1950 to January 25, 1951). Regulations require all producers to file Public Form 8, which if done improperly will bring a query from the O.P.S. Mr. Brunenkant pointed out errors frequently made in filing reports, such as not using a calendar quarter as a base period, and incorrect application of the adjustment factors to the base period price. Under CPR 22, the selling price cannot exceed the base period price plus the product of multiplying base period price by sum of the adjustment factors.

Edward J. Brunenkant

The regulations described, and the Capehart Amendment in addition, Mr. Brunenkant said, are not particularly well adapted to the pricing problems of the concrete masonry industry. What is needed, he said, and what is being formulated, is the establishment of ceiling prices on an area basis.

Delmar G. Runner

Further details of the price control program were presented by Delmar G. Runner, chief of the cement and concrete section, Building Materials Division of N.P.A. In his remarks, Mr. Runner included his outlook on the availability of portland cement in 1952. In spite of the heavy demand, he thinks cement will be readily available, and quoted industry capacity figures to substantiate this. Of course, the needs of the arms pro-

Left: Murray (left) and Sam Levine, Samson Block Co., Miami, Fla., pose for a picture. Center: Jack Freedman, Massachusetts Cement Block Co., Medford, Mass., left, chats with Walter W. Horn, Cinder Block, Inc., Detroit, Mich. Right: E. W. Dienhart, executive secretary, N.C.M.A., left and George W. Kulhavy, Carter-Waters Corp., Kansas City, Mo.

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gram must be met first, but other factors point to an adequate civilian supply also.

How to Sell

Sales psychology in merchandising was the subject dynamically expounded by Frank Goodwin, professor of marketing, University of Florida, Gainesville. By use of humorous charts, Mr. Goodwin showed the steps required in selling any product — production, layout, display, good will. Selling is a part of the game of human relations, he said. In fact, most of the unsolved problems in the world fall into the field of human relations, specifically, how to get along with people. One of the points Mr. Goodwin made in emphasizing the importance of human relations was the fact that a company's representative becomes the company to customers. It is very difficult to estimate the damage that can be done by little things in this crucial employe-customer relationship, he said.

Frank Goodwin

Symposium on Drying

A technical session occupied all of the second day of the meeting. George Mansfield, chairman of the N.C.M.A. technical problems committee, presided over the morning session, and R. Neil Christy, member of the committee, was the chairman of the afternoon session. A symposium on covered storage and methods of drying concrete masonry units brought six men to the head table to discuss the problem and some possible solutions. R. E. Copeland, N.C.M.A. director of engineering, stated the reasons why drying and storage are important topics now, reiterating the tightening specifications on moisture content of units. There is still much to be done to determine good methods, he said.

Cloyd Fellabaum, National Cement Products Co., Toledo, Ohio, showed slides of the covered storage area at his plant. This shed holds a total of 99,144 block, he said, and its advantages are that bad weather never interfered with handling, and that economies derived from covered storage easily paid for the initial cost.

Ben Wilk, Standard Building Products Co., Detroit, Mich., the next speaker, said that his covered storage area cost $1.10 per sq. ft. without finished floor. A floor, he estimated, would cost an additional 35-50 cents, depending on type. His shed, 120 x 120 ft., cost approximately $15,000, and was constructed of concrete with aluminum roof.

The covered storage area of Cleveland Builders Supply Co. was described by Ralph Reiner. The main area will store 270,000 units, and a second covered area holds about 120,000. The first one, built in 1945, Mr. Reiner estimated had cost $0.005 per 8-in. unit based on total yearly production. The second shed (of timber and steel construction) cost but little more.

D. O. McCall, Basalt Rock Co., Napa, Calif., said his company dried block in tunnels before shipping because of the high humidity conditions in the area. Units are cured with low pressure steam, then cubed and yard stored. Summers are hot, so unheated air is blown through most units in the tunnels. In winter, the majority of units are dried by heated air. An on-off cycle is less costly, Mr. McCall said. In practice, air at 170 deg. F. is blown through the tunnels for an hour, then the blower is turned off, after which the cycle is repeated. Block are dried for 24 hr. or less in winter.

D. L. Sutter, Anchor Concrete Products, Buffalo, N.Y., described a drying system in use at the Buffalo plant. Outside air is drawn into kilns through steam unit heaters, and the moist air exhausted by 8800-c.f.m. blowers. This system dries block well under the 30 percent moisture content figure now required by the Corps of Engineers, Mr. Sutter reported. Slides were shown of the drying system added to an existing kiln, of test results of dried block and of an experimental kiln. The new kiln will recirculate the moisture laden warm air through an oil-fired boiler. A pilot kiln 3 ft. high is now being tested using this principle. When asked if air turbulence is bad, Mr. Sutter replied that in their present thinking it is undesirable, that what is desired is directional flow.

A report on the N.C.M.A. project on load tests of reinforced concrete masonry lintels was presented by Professor H. E. Mayrose, University of Detroit. This was in the form of a preliminary report, details of which are to be published in full by the association. Many tests were run last year on lintels constructed of different styles of block produced from various aggregates.

E. M. Barnes, Knox Concrete Products, Inc., Knoxville, Tenn., talked on prestressed concrete masonry. No recognized standards have been set up yet for prestressed concrete, he reported. The speaker mentioned the M.I.T. conference on prestressed concrete and what was accomplished. Advantages of prestressing, he said, are that concrete in compression is crack free, thinner beams can be constructed, more cross sections can be used, and the amount of steel and concrete needed for a beam is reduced. The concrete masonry producers fit into the picture, Mr. Barnes said, for many prestressed units are constructed of masonry units.

E. M. Barnes

Two unscheduled speakers followed Mr. Barnes, supplementing his re-

Left: (l. to r.) Loyd C. Pender, Michigan Certified Concrete Products Co., Grand Rapids, Mich.; C. A. Sirrine, executive secretary, Concrete Products Association of Detroit; and Clem Mason, Besser Manufacturing Co. Right: (l. to r.) Josiah G. Lewis, Scranton Building Block Co., Scranton, Penn.; Edward E. Meeker, M. & M. Engineering Corp., Indianapolis, Ind.; and Jack Ridgley, Ridgley Block Co., Wyoming, Penn.

Left: Walter Warren, with microphone, explains details of the Waylite Co.'s lightweight aggregate plant on the field trip for N.C.M.A. members. Right: Harvey A. Lee, Anchor Concrete Products Co., Buffalo, N.Y., left, chairman of the warm air panel heating committee of National Flexicore Manufacturers Association, admires an N.C.M.A. poster with Fred W. Reinhold, also with Anchor Concrete Products

marks on prestressed concrete. L. Coff, consulting engineer, New York, N.Y., pointed out the big potential demand for prestressed bridges, and how tremendous amounts of steel would be saved by following prestressing methods. A good market for masonry units would be stimulated, he said, for a small bridge only 30-40 ft. long requires over 1000 block. Ben Wilk described 60-ft. prestressed beams designed by Johnson and Anderson, Pontiac, Mich., and made by his company in Detroit. These were I-beams, which are most practical for bridge use, he said. The dimensions of the beams are 16 in. wide x 24 in. deep. The 1-in. steel cables are placed on the bottom, with terminals at both ends. These beams were used in constructing a three-span, 24-ft. wide bridge in Detroit.

Control Joints

A consulting engineer from Alpena, Mich., Robert S. Scott, had many worthwhile things to tell the producers about how masonry units should be used. In particular, he referred to the use of control joints in preventing wall cracking. It's hard to select where to put joints, though in general the permanent shade side of a building is the best place, Mr. Scott said. Where there is a long window area, a joint should be put in the area of most mass. On short spans of 30 ft. or less, a joint should be put in the middle. Nevertheless, difficulty is experienced in building concrete masonry walls on poured concrete foundations, because of differences in shrinkage characteristics, the speaker said.

Robert S. Scott

Don't hide joints, Mr. Scott stated. Caulk them, and replace the caulking when necessary. Masons and contractors accept joints, and they add to cost only slightly. A good idea for joints is to place $\frac{3}{8}$- to $\frac{1}{2}$-in. felt or Fiberglas back-up to fiber or caulking compound. This acts as a blotter or sponge to take up dislodged particles, Mr. Scott said. Volume changes due to moisture and temperature variations have to go some place without spalling, and the joint he mentioned reduced this possibility.

Mr. Scott called for more research by producers on placement of joints. There is a difference in curing time between block and mortar, he said, suggesting that the ideal solution to this is to soak the block and have the mortar wet during placing, then cure both together. He found that waterproofing a new wall is difficult, whereas this operation on a year-old wall gives a smooth job.

Slides of an outstanding school construction job in Alpena were shown and described by Mr. Scott. He stated that joints must be carried all the way through a building. This is structurally safe, but isn't always pleasing to the eye unless done properly.

Reducing Wall Cracking

D. L. Chaney, regional structural engineer, Portland Cement Association, Atlanta, Ga., repeated the talk he gave at the Southeastern regional N.C.M.A. meeting in New Orleans last November. The topic was design details as a factor in the cracking of masonry walls. Mr. Chaney's talk will be reported here in brief. The blame for defects in masonry walls almost always falls on the producer, he said; thus it is up to the producer to make the best block possible to minimize defects. The trend to one-story schools was described, and some of the design problems which have arisen with masonry walls. Perimeter beams cast on top of masonry walls, for instance, shrank at a different rate than did the walls, resulting in cracks near the building corners. Mr. Chaney also advised that control joints be placed in walls, not more than 100 ft. apart. Perimeter beams should also be jointed. Inclusion of slide planes between precast lintels and walls will eliminate most cracks appearing over windows, he said.

Insulation placed on top of a slab roof, above any slide planes, will stop between 60-70 percent of any length changes in the structure. Since canopies also pick up heat and carry it to the beam, insulation on the canopy to stop the heat transfer is well worth the extra cost, he said.

Ben Wilk delivered some comments from the floor on a joint developed in Detroit. This uses full and half block. Tar paper is used in half of the interior core to separate the wall, and mortar is put into the central core to prevent lateral deflection; cork is placed in the joint, and the inside face of the joint left open to be filled with caulking.

High Pressure Curing

The high pressure steam curing system in use at Harter Marblecrete Stone Co., Oklahoma City, Okla., was described by Noel D. Harter. This $200,000 improvement was made to improve quality, not quantity of units, he stated. Mr. Harter felt that high pressure steam curing offers these advantages: moisture content is 6-20 percent, high strengths are reached in minimum time, and low shrinkage occurs. Details of the curing cycle and vacuum drying system used in the five 8-ft. dia. autoclaves are also contained in an article

Noel D. Harter

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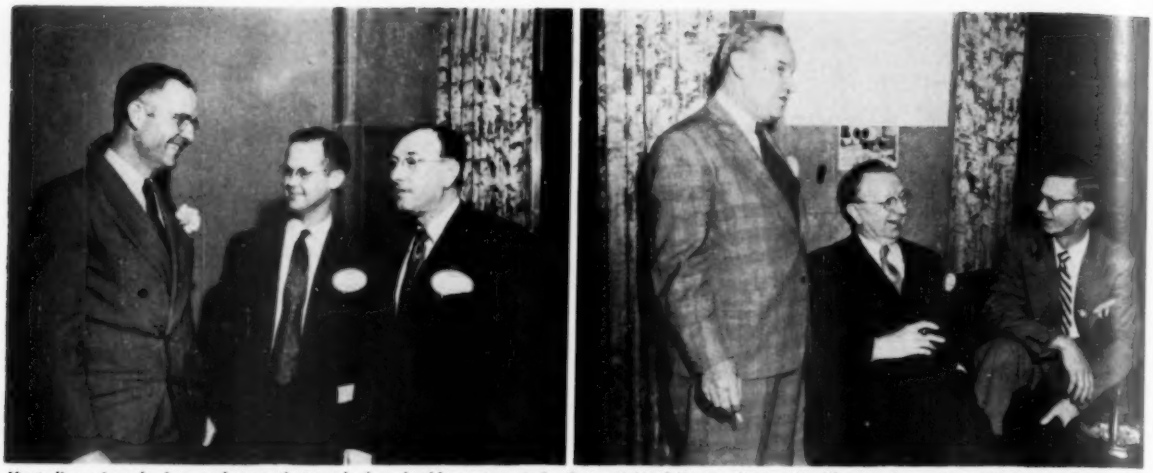

Most discussions had some humor that evoked a chuckle or two. Left: (l. to r.) Noel Harter, Harter Marblecrete Stone Co., Oklahoma City, Okla.; Jim Chandler and Leonard L. Jones, both with Chandler Material Co., Tulsa, Okla. Right: (l. to r.) C. L. Irwin and J. J. Ryan, both with Ryan Builders Supplies, Windsor, Ont., Canada; and Larry Vander Heyden, Dox Blox System, St. Paul Park, Minn.

in the October, 1951 issue of CONCRETE PRODUCTS, page 173.

Vacuum drying is provided in the autoclaves after curing. A 26-in. vacuum is reached in about 15 min. At this point, the boiling point of water is 150 deg. F., and since the units are hotter than this the moisture is rapidly dissipated. Maintenance costs are reduced with this system, particularly replacement costs of racks; corrosion does not affect racks since there is no air added to support oxidation. Other costs are less, also. Mr. Harter estimated curing costs at 1 cent a block, though the initial cost was high and not included in this figure.

Promoting Floor System

Ceramic and concrete masonry units should not compete, according to W. M. Stoner, Jr., Western Brick & Supply Co., Lincoln, Neb. They provide a good combination, he said, in describing his company's addition of concrete masonry to its line of brick and clay units. One of the biggest markets for concrete units has been for roof systems, Mr. Stoner reported. Soffit block system was chosen by Western Brick because ground units were considered too expensive to produce. The principal drawback to this type of block, the speaker said, is that the projections at the ends are easily broken. Erecting equipment is also expensive and needs much maintenance.

Soffit floor system was introduced to architects at a demonstration. A movie was also shown on construction techniques. Nearly 1,000,000 units were sold the first year; most jobs were designed and construction supervised by the producer. One selling point was a guarantee to the contractor that cost of floor placement would not exceed a set amount.

Regional Associations

Officers of local, state and regional associations were called upon, in the promotional session, to review their activities in 1951, particularly in the field of sales promotion. These associations have been active during recent years and are effective in meeting problems at the local level.

Earl W. Peterson reported for the Nebraska Concrete Masonry Association and the Concrete Masonry Association of Omaha. A committee has been actively working with the highway department in connection with research on prestressed bridges. An advertising program is to be started in the *Nebraska Farmer* to develop farm markets. Exposed concrete masonry walls are being effectively promoted. Among developments are a $6,500,000 auditorium that will be of exposed masonry. Schools are starting to be built with exposed masonry walls and multi-apartment buildings with exposed lightweight partitions and backup of masonry. In such buildings, plaster will be eliminated.

In reporting for the North Carolina Concrete Masonry Association, H. J. Stockard, Jr. said that the group was formed five and one-half years ago for the purpose of developing public relations and as a means to regulate quality of product. Tests of masonry units are made monthly and results kept on file in the association office. Membership in the association thus is a symbol of quality. Six meetings were held in 1951 and weekly reports are submitted on activities.

F. G. Haines, reporting for the Allegheny Concrete Block Association of Allegheny county, Penn., said that the organziation is for the purpose of engineering and promotional activities. It has been active for three years, has 20 members and was set up to serve bordering counties as well.

During 1951, promotion has been actively directed toward banks and other financing agencies, and efforts are being concentrated on promoting concrete masonry homes. To make the public concrete masonry home conscious, the radio was used during National Home Week and the booklet "Why People Like Concrete Homes" has been promoted. Some 1600 requests for the booklets were received. Displays are also used. More advertising is to be done in 1952. Another activity is visits to schools that teach masonry, the purpose being to stimulate good workmanship with concrete masonry units.

George W. Kulhavy explained the operations of Mo-Kan Concrete Products Association which has employed Tip Brown, formerly of Lehigh Portland Cement Co., as paid secretary. The association was started in 1950 and was set up for a program of regular meetings. The early meetings were social in nature so that members could become thoroughly acquainted. Dues are $50 annually per production machine. Membership has been growing and producers from outlying communities have been invited to join. Meetings are drawing in excess of 40 and outside speakers including top officials of N.C.M.A. and P.C.A. are invited to discuss technical problems, promotion, etc.

Late in 1951 a joint meeting was held with F.H.A. officials and, in December, an annual party was scheduled. A concrete masonry display was scheduled for the home show at the Kansas City auditorium. Marshall Harrison, president of the Mason Contractors Association of America, who is a close friend of the industry, donated his services in building the display. The association furnished a bronze plaque for the display, listing the membership of the association and the contractors who specialize in concrete masonry. A demonstration home is to be built soon. Every member of the association serves on some committee.

O. H. Seeger, representing the Columbus Block Manufacturers' Association, Ohio, said that all principal block manufacturers in the area have united and pledged themselves to

maintain high quality standards. During 1951, the group made additions to its plan book, including designs of low-cost homes and garages for architects. An exhibit was conducted at the home show. Association members exchange credit information and technical data, and have a close working organization.

Concrete Products Association of Washington, Seattle, has 28 member companies and 14 associate members, according to George Duecy, and has a $25,000 operating budget. Engineer-director C. M. Howard of the association is a recognized authority on all concrete products and concrete pipe. An architect assistant is to be hired. This group makes good use of promotional material available from N.C.M.A. and other sources and advertises extensively in engineering and architectural magazines as well as in newspapers and consumer magazines. An advertising program is to be carried in farm papers this year.

Art Devos summarized activities of the Wisconsin Concrete Products Association, Milwaukee, which was organized at the same time N.C.M.A. was started. Much of its activities in recent years has been in working with code authorities in the development of specifications for loadbearing walls. Having mortar reinforcement specified for walls has greatly increased the use of concrete masonry units. The most recent annual convention of the association, as reported in the February, 1952, issue of CONCRETE PRODUCTS, pages 167-168, is evidence of the progressiveness and activities of the group. Mr. Devos concluded his brief remarks by inviting N.C.M.A. to hold its 1954 off-exposition convention in Milwaukee.

C. A. Sirrine reported activities of the Concrete Products Association of Detroit. This group makes extensive use of N.C.M.A. promotion material and, as Mr. Sirrine expressed it, serves as a demonstration of how cooperative effort between the N.C.M.A. and local organizations may be combined for effective results. The Detroit group continues extremely active in the development of masonry construction details and plans for use by architects and builders and has offered to make its drawing available to others in the industry. An architectural competition for architects and architectural students is being sponsored and the results will be given wide publicity. The group is stressing wider use of exposed masonry walls particularly in home construction.

Mr. Sirrine then introduced Leo Bauer, Detroit architect, who said that the details for concrete masonry construction as supplied by the local association were excellent and that he hoped similar efforts would be made available to architects nationally. Mr. Bauer was a strong booster for the industry, the local association and would make a wonderful member for the Detroit and Michigan Chambers of Commerce.

Walter Coupland, president of the National Concrete Products Association of Canada, had just come from his association's annual convention in Windsor, Canada, and gave a brief report on activities. Membership was increased by 15 percent in 1951 and 250 delegates attended the convention and machinery exposition. There are now more than 100 members and the annual budget is $6000. The 1953 convention will be held in Montreal.

Concrete Masonry Display

Carl A. Menzel, manager, Housing and Cement Products Bureau, Portland Cement Association, Chicago, Ill., in a talk "Concrete Masonry on Display at the P.C.A.," showed numerous colored slides of concrete masonry construction features at the new P.C.A. research and development laboratories at Skokie, Ill., and also slides of the offices in Chicago, Ill.

Carl A. Menzel

In both buildings the greatest possible use of concrete masonry has been made, and they serve as outstanding examples of the effective treatments and applications that may be utilized to create beauty and eye appeal in concrete masonry. Various ashlar effects, jointings and surface textures, in many colors, were shown in beautiful photographic slides.

In his opening remarks, Mr. Menzel paid tribute to Francis J. Straub for his early work in gaining acceptance of concrete masonry units and he traced significant developments like the early fire tests on which W. D. M. Allan and E. W. Dienhart were active and which led to national recognition for concrete masonry.

Radiant Heating

"Warm Air Radiant Heating with Concrete Masonry Floors" was the subject of a talk by Morris Gross, consulting engineer, Detroit, Mich., and Harvey Lee, Anchor Concrete Products, Inc., Buffalo, N.Y.

The principles of radiant heating were described and the adaptability of precast concrete floors to the system was pointed out. The warm air heating idea is a strong stimulus to enlarging the markets for concrete units, said Mr. Lee, because women often complain that concrete floors are cold. As he expressed it, the industry can sell objectors heat along with concrete floors. Promoting the idea is proving effective in breaking down sales resistance to concrete unit construction.

Such floors cost in the neighborhood of 60 cents per sq. ft. and they usually are plastered on the underside with perlite or vermiculite plaster to conserve heat. Systems of radiant heating with concrete floors have been designed and soon are to be given national distribution.

Balancing the Budget

"Building for Tomorrow" was the title of an inspiring talk by Dr. Alfred P. Haake who is an economist, consultant to General Motors Corp. and mayor of Park Ridge, Ill. Dr. Haake took strong issue with our national economic policies and advocates drastic cutting of the budgets for every department and activity in the national government. Then, each department and agency would have to be geared to come within the funds alloted and in no uncertain terms.

Expanded Shale Aggregate

Otto C. Frei, vice-president, Smithwick Concrete Products, Portland, Ore., in a paper entitled "Expanded Shale: Plant Development, Design and Manufacture," covered the entire subject from the viewpoint of one experienced in plant engineering and layout, production and the economics of operation. Mr. Frei, prior to his affiliation with Smithwick in 1949, had had a background of great experience in the chemistry and the production of portland cement, also having been president of the Washington-Idaho Lime Products Co., Orafino, Idaho.

The benefits of this experience, and more recently in the design and operation of Smithwick's modern rotary kiln Haydite plant at Portland, Ore., are now being made available nationally to producers and prospective producers of expanded shale aggregate as an activity of Smithwick Concrete Products. Thus, for the first time the industry has specialized engineering service available to it which ecompasses all features of economy in production.

To start off, Mr. Frei first detailed the early history of expanded shale aggregate and then the growing demand for the product which has far outstripped productive capacity. It is only during the last five years that there has been any reasonable increase in productive capacity and that has been in existing older plants. New producing plants have been developed, he said, notably in Texas, Kansas, California and the Pacific Northwest during the last three years and considerable plant building activity is underway now but expanded shale will be in short supply in many areas for some considerable time.

Otto C. Frei

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The favorable physical characteristics of the aggregate and the concrete made from it were summarized as was the trend toward greater use of lightweight concrete units as contrasted to heavy aggregate units. Among economies realized are savings in masonry labor costs and in transportation, he said, which reflect in reduced total cost of a masonry wall.

Whereas it has been reported that 52 percent of total block production in the United States is of lightweight units, showing a decided trend, the figure is 95 percent in the case of Mr. Frei's company, just five years after lightweight units were made available.

He pointed out that many of the older expanded shale plants have been built with used items of major equipment rejected by other industries and that little if any consideration has been given to combustion efficiency, waste heat recovery, power factor, labor utilization, layout for future expansion and other important operating factors. Geographic distribution of those plants has been such that competition was not important but, as he pointed out, there are now significant changes stimulating plant development which require that expanded shale be produced at lowest possible unit cost. Competition is setting in, which will favor the economical producer. Among new plant developments mentioned are those in Kansas, Kentucky, Georgia, the Dakotas, California and Ohio.

Among fundamentals mentioned as essential for efficient, low-cost operation were (1) full knowledge of market potential, (2) guaranteed supplies of suitable raw materials, (3) qualified engineering design of plant in all its details and (4) effective dust recovery methods.

Since T. B. Hartless, Richmond, Va., followed Mr. Frei's presentation with a discussion of market potential and raw material investigation, Mr. Frei gave emphasis to engineering design and layout in the balance of his paper.

He touched upon the dearth of specialized knowledge and experience available to the industry from heavy industrial equipment manufacturers who are well qualified in the design of plants for other products. Among the variables which must be considered are the crushing and handling characteristics of shales, which differ widely between and within deposits, and differences in expandability between different shales, etc. To emphasize, he said that the fact that one or more plants use a 6- x 60-ft. or an 8- x 125-ft. rotary kiln does not mean that either size is advisable for another plant.

Modern design includes cooling the hot clinker for immediate crushing and handling and also should include recuperating sensible heat from the clinker. In the company's plant at Portland, Ore., fuel input per cu. yd. of aggregate produced has been reduced by 15.6 percent through heat recovery from the hot clinker. Selection of a kiln as to diameter, length and pitch should be based on known values as determined by the raw material investigations, and choice of crushers and handling equipment must be determined according to the physical characteristics of the material.

Collection of dust is considered of extreme importance for better working and community relations and as protection against possible lawsuits. An efficient dust collection system is effective in the Smithwick plant which adjoins a residential neighborhood.

Mr. Frei next described, and illustrated with slides, the company's 300 cu. yd. per day plant in Portland. Details are not included here since the plant was completely described in the October, 1950, issue of ROCK PRODUCTS, pages 163-165.

As a result of experience with the plant, it has been proved that larger rotary kilns than those commonly used for the purpose offer great advantages in fuel utilization, uniformity of product and greater production. The largest single item of cost is fuel, so a 5½- x 50-ft. rotary cooler was installed and heat is thereby recovered for secondary combustion in the kiln. The annual saving in fuel, 15.6 percent, amounts to 200,000 gal. of fuel oil annually. Through use of automatic devices and other features, only ten men are required per 24-hr. period for the entire operation, exclusive of quarrying.

Dust is controlled by a combination of a centrifugal dust collector system and a washing tower, thus exhausting gases as a vapor. Dust from the kiln and other sources is recovered by a 40-tube Multiclone collector and the major portion is mixed with water for disposal, gases discharging into the washing tower.

Mr. Frei reported that use of expanded shale block in construction has almost completely eliminated cracking in masonry walls and that reduced cement factors are permissible in meeting specifications for loadbearing units. He summarized many of the applications of the material which include laundry trays, precast slabs, tilt-up wall panels, bridges and monolithic concrete uses.

Mr. Frei and Smithwick Concrete Products have been serving as consulting engineers in the design of new plants, among those mentioned being those of Buildex, Inc., in Kansas, Sunnyhill Aggregates Corp. at New Lexington, Ohio, and the Ohio River Sand Co., at Lousville, Ky.

T. B. Hartless, Richmond, Va., discussed considerations in the determination of market potentials and factors of importance in the investigation of raw materials sources, necessary before the decision is made to establish an expanded shale plant. He first touched upon the great increase in use of lightweight concrete masonry units and the potential demand, also upon markets for lightweight aggregates in monolithic structures.

Important to whether or not a new plant be established, he said, is a market analysis of the territory within a 300-mile circle around the prospective location, which would determine the population density and the extent of anticipated industrial development. The possibility of future competitive plants must also be considered as well as the transportation facilities and costs of delivering.

A thorough investigation of the available raw materials is recommended, which would start with a 100-lb. cross-sectional sample which would be tested as to behavior in a rotary kiln. Results obtained, while they might be misleading, would indicate the advisability of further study and might then indicate the need for tests, say, of from two to five tons of material that would be representative of the deposit. This material would be put through various sizes and types of crushers to determine the most effective equipment and through a rotary kiln of commercial size to determine the characteristics of the expanded aggregate. The next step would be a thorough chemical analysis by a good commercial laboratory and then physical analysis according to A.S.T.M. procedure for soundness, specific gravity, absorption and strength ratio. Mixes should then be designed for concrete in the 2000-6000 p.s.i. compressive strength range to be followed by strength, unit weight, absorption and workability tests. Finally, commercial masonry units should be made to determine cement factor, unit weights, etc. All the suggested tests should provide satisfactory results before the decision be made to build a plant.

Aggregate Meetings

Meetings of producers interested in individual aggregates were held following the general aggregate session. The aggregates discussed, with the chairman of each meeting listed, were: Celocrete, Thomas S. Cousins, Celocrete Division, Celotex Corp., Chicago, Ill., presiding; cinders, Sam Paturzo of V. Paturzo Bro. & Son, Baltimore, Maryland, presiding; Enslite, W. R. Ireland, Birmingham Slag Co., Birmingham, Ala., in charge; natural aggregate, Benjamin Wilk, Standard Building Products Co., Detroit, Mich., leading the discussion; pumice, J. P. Sheehan, Atlas Building Products Co., El Paso, Texas, presiding; Carroll Strohm of Nashville Breeko Block & Tile Co., Nashville, Tenn., conducted the Superock meeting; and the Waylite group was presided over by Harold L. Spaight, Cedar Rapids Block Co., Cedar Rapids, Iowa.

Field Trip

Members of the board of directors and past presidents of the association

(Continued on page 211)

STEAM-COATING STEEL PIPE WITH CEMENT MORTAR

High production method developed for cover-coating steel pipe with cement mortar also offers possibilities for coating prestressed concrete pressure pipe

By M. W. LOVING*

Fig. 1: Cover-coating steel pipe with cement mortar by new steam-coating process. Just as soon as the steel pipe are cover-coated, they are lifted off the lathe carriage, which operates on industrial track. Belt slings are used to handle the pipe, with no injury to the cement mortar cover-coating

A NEW AND EFFECTIVE PROCESS, known under the trade name of "Steam-Cote," is used for cover-coating steel pipe, made in 40-ft. lengths and in the smaller diameters, in a fraction of the time required by other methods. It was developed by Steam-Cote Corp., Escondido, Calif., of which E. L. Webb is president and T. R. Vessels, development engineer. Moreover, the new process has been in commercial production for more than a year by one of the larger steel pipe companies in California.

The action photographs which illustrate this article were taken in the pilot plant in Escondido and in the plant of the steel pipe company. They were using the steam-coat process for cover-coating 8-in. diameter steel pipe, made in 40-ft. lengths. It took about 8 min. on and off the machine, to cover-coat these pipe, and it was a continuous operation without any delays.

Steam-Cote is not an expensive process, because it has been reduced to its simplest elements; it has many advantages over any process yet devised and the finished cement mortar coatings are of excellent quality.

*Consulting engineer, Glenview, Ill.

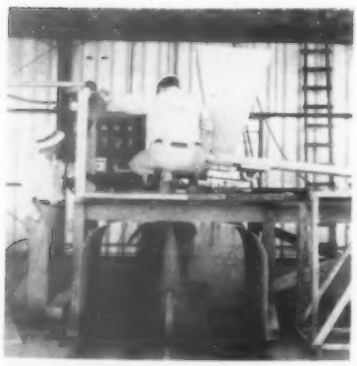

Fig. 2: Pilot plant for the new mortar coating process set up by Steam-Cote Corp. at Escondido, Calif.

History of Cover-Coating

Cement mortar, made with natural cement, was first used in this country for lining and cover-coating wrought iron water pipe in Jersey City, N.J., in 1845 and in Saratoga, N.Y., in 1847. It was used extensively for the same purpose in Plymouth, Mass., in 1855 to replace wood pipe.

The advantages of cement mortar for protecting cast iron water pipe against tuberculation, oxidation or rusting by active or aggressive waters were first discovered by the French Academy of Sciences in 1836—116 years ago. In numerous cities along our eastern seaboard, many miles of these old wrought iron pipe, lined and coated with natural cement mortar, are in service today. No other use of cement mortar or concrete has been more successful for so long, or more thoroughly investigated by leading water works engineers.

It is interesting to know how these early pipe were made by the old timers, who did not have our present-day facilities. The cylinders were made with wrought iron sheets imported from England; sheets for 4-in. diameter pipe were 24 gauge and 24-in. diameter pipe were made with 12-gauge sheets, which were formed as semi-circles and riveted together on 0.75-in. centers to form cylinders 9 ft. long.

Cylinders for the 12- and 24-in. diameter pipe were placed on ordinary sawhorses, and workmen at each end used long handled pallet knives to butter the lower half with cement mortar. After the mortar hardened in about 12 hr., the cylinders were rolled over and the other half was lined in a similar manner. A long handled, round brush or "nigger-head" was used to place cement grout on the inner surface to provide a smooth finish.

After they were cured with water spray for about two weeks, the lined pipe were placed on wagons and hauled to the trench site and laid in beds of cement mortar, the ends butted together, with metal collars around each joint. The sides and top of the metal cylinders were plastered with cement mortar and the joints made the same way. Many of these pipe lines operated, and still operate, under internal hydrostatic pressures of about 50 p.s.i. There are about 400 miles of these pipe lines still in operation in towns in the vicinity of Philadelphia, Penn.; many have been in service for more than 50 years.

Steam-Cote Process

Because cast iron pipe and steel pipe must be protected against oxidation with cement mortar linings, coating or both, on every important project where active, or aggressive waters are encountered, any process used for these purposes must be effective,

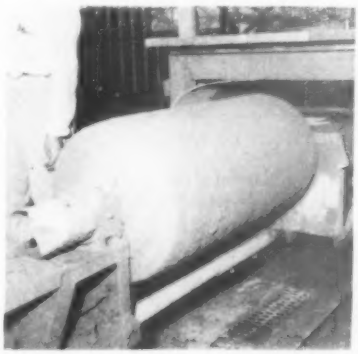

Fig. 3: This steel cylinder was provided with a cement mortar cover-coat in a few minutes with one pass

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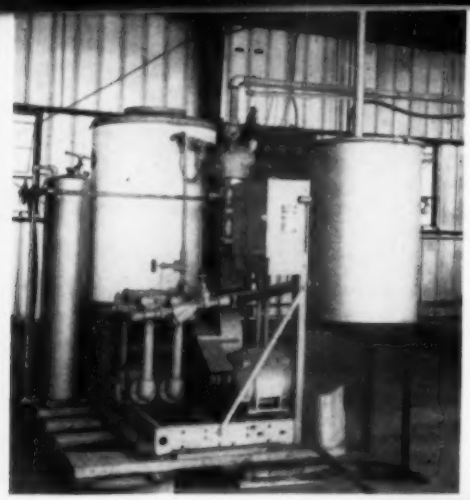

Fig. 4: An ample supply of steam, automatically controlled, is supplied by this steam generator

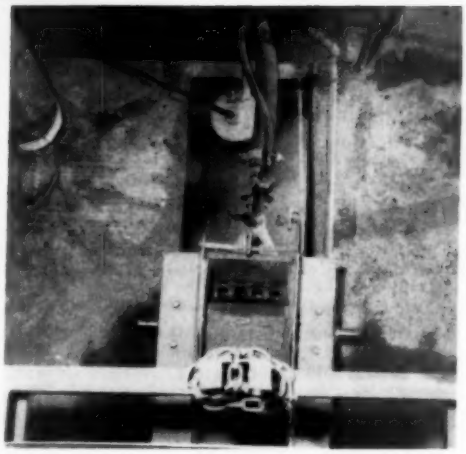

Fig. 5: Operations at the steel pipe plant were halted while this picture of the four openings of the nozzles was taken; note the uniform flow of cement-sand mixture on the belt in the foreground

Fig. 6: View of the entire assembly while an 8-in. x 40-ft. steel pipe was being cover-coated with cement mortar

Fig. 7: Typical view of the 8-in. pipe in storage, after they were lined with cement mortar by centrifugal process and cover-coated with cement mortar by the new steam-coating process

fast and inexpensive. In most cases, the steel or cast iron pipe are lined with cement mortar by the centrifugal process. Until the Steam-Cote process was developed at Escondido, Calif., by Mr. Vessels, the several processes used for cover-coating steel water pipe with cement mortar were and still are expensive.

The simple machine for cover-coating steel pipe with cement mortar is shown in Fig. 2, taken at the pilot plant in Escondido and Fig. 3 shows a pipe which was coated with a thickness of about 2 in. in a few minutes. The Clayton steam generator is shown in Fig. 4; with this equipment it is possible to provide a fully automatic and easily controlled source of steam for the four spray-nozzles.

Fig. 5, taken at the steel pipe plant, shows the openings of the four nozzles to which the sand-cement mixture is conveyed with belts; this mixture is drawn into the guns by a combination gravity and vacuum action, and is uniformly blended with water to provide the right consistency. The entire spraying assembly (Fig. 6) including hopper, belt, manifold and guns is mounted above and to the side of the pipe to be coated. From his position above the pipe, the operator can observe and control every step in the operation.

Since September, 1951, the time required to cover-coat an 8 in. diameter steel pipe, 40 ft. long, has been reduced to about 6.5 min. Fig. 1 and 6 show how the long steel pipe is conveyed, and slowly revolved, on a lathe carriage and truck which operate on industrial track long enough to take the pipe past the steam-coating assembly. Just after the pipe are coated, they are lifted from the lathe with belt-slings (Fig. 1); the mortar coating is hard enough to prevent injury to it in this method of handling.

Rebound Reduced to Minimum

In watching this operation at the pilot plant in Escondido, and at the steel pipe plant, the author was impressed with the lack of rebound of the cement mortar when placed by the Steam-Cote process; it seemed to be actually sucked onto the small diameter pipe. Besides, little of the mortar actually missed the pipe at each side, which one would naturally expect; the loss of mortar was said to be less than 10 percent. With pipe of larger diameters, this loss may be further reduced.

Because mortar is placed with steam at a high temperature, and the required amount of water is blended with the cement-sand mixture, hardening of the mortar cover-coats is accelerated. In other words, the cement mortar cover-coats are steam-cured as they are placed on the steel pipe; this accounts for the early hardening which makes possible the handling and storage of the pipe, for further curing, with the belt-slings.

In Fig. 7 a section of the storage

(Continued on page 211)

Training Craftsmen to Serve Concrete Masonry Industry

Problem of growing shortage of skilled masons approached by instituting basic course in high school vocational training program

By RALPH C. CONDO*

FOR MANY YEARS the National Concrete Masonry Association has been striving to build the concrete masonry business to a subtantial industry which now has millions of dollars invested in plants and machinery as a result. Our product has been improved to the point where if I were asked today to make a better block, I wouldn't know where or how to start.

The work done by members of the industry and through the efforts of the National Concrete Masonry Association and its staff, which I have watched grow through the years of my association with the industry, has been so thorough that it often makes me wonder whether or not the industry will survive unless we begin to do other things in addition to stepping up production, improving our products and creating a greater market for these products.

As I see it, the industry is faced with two important problems which are much more important than the other things we have accomplished in the 25 years that I have been in the concrete products business.

The Problems

In localities where the industry depends upon cinders and manufactured aggregate, more time, money and thought should be given to research in the production of manufactured aggregate, if these industries are to stay in business and protect their investment. This is one of the two problems.

Credit should be given to members in areas that have seen fit to develop natural resources and are bringing to harvest the results of their efforts. However, I am mainly worried about problem number two, and that is the future availability of masons.

In the Somerset county area of New Jersey, I am confronted with the situation that in the next ten years, regardless of how much I step up production or improve my product, I will not have anyone to lay my block. With the mortality rate of our masons coupled with the lack of opportunity offered to our younger generation to learn the art of masonry, all of our efforts will have been wasted and it will be necessary to go to the prefabrication of substitute materials.

What are we doing about it? Have we really given it serious thought? Have we offered our youth an opportunity to learn how to lay the block we make? Have we tried to sell the art of masonry to the public, to the vocational schools or to the boy finishing high school?

Ask yourself these questions and I think you will find that we of the industry have a tremendous selling job to do if we want to continue to stay in the block business.

The industry has grown in 25 years. But don't you think this is partly due to the times and conditions? We have participated in two major wars and are now in what might be termed a third one in one generation. In war times most businesses are good and ours has been no exception. But, perhaps some of our cracked walls are due to the fact that, under pressure, the work has been done barely good enough by so-called masons who evidence an astounding lack of proper training.

This, of course, applies to those who got on the band wagon and called themselves masons because of the scarcity of qualified masons and because of the good hourly rate paid by the trade.

Regardless of how good the block is that we manufacture, it is only as good as the man who lays it in a wall. His workmanship, plus a good well-cured block, plus a well-proportioned and well-mixed mortar of the correct type, governs the quality of the walls in our buildings. And, of course, some thought should be given to the part of the designing architect and the supervising foreman on the project.

A Solution

As an individual, and without the backing of an organization, which I am sorry to say we do not have in New Jersey, I could only hope to take action in my own home town of Somerville, N.J.

Confronted with the problem in the future of lack of masons to lay my block, the survival of my business is at stake. It is not economical for the few reliable mason contractors left in the area to take on apprentices, because the union regulations require the contractor to pay 50 percent of the craftsmen's rates to the apprentice—this becomes a financial problem to the contractor. Rates are $3.10 per hr. for a qualified mason, which means

Ralph C. Condo

The shortage of skilled masons which is resulting because far to few young men have the opportunity or desire to learn the trade may well become critical to the concrete masonry industry. It is already becoming serious in many areas because relatively few masons have been trained in recent years.

Ralph C. Condo, author of this article, has taken positive action to meet the problem by initiating a course of study in masonry at his local high school, with the cooperation of school officials. We asked Mr. Condo to write this article since his approach, in selling the student on the idea and in working closely with the high school on the project, might be applicable in other communities faced with a shortage of masons—THE EDITORS

*James Condo & Son, Somerville, N.J.

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$1.55 per hr. must be paid to a boy learning the trade, and there is the penalty of loss of time on the part of the mason who is teaching the boy the trade. This loss of time is estimated to be one-fourth the mason's full time, which means that two hours of the mason's time at $3.10 per hr. is lost during each day. Thus, the cost of apprentice labor is extremely high, which is one of the reasons that masons are becoming scarce. Since these conditions exist there is nothing we can do about the situation as far as the active masons are concerned.

The thought ocurred to me that something could be done about teaching the art of masonry in our public schools. Naturally I am interested in what becomes of my tax dollar, particularly my school tax dollar, and I knew that for years we have been training young people who are interested in office work. A business t in-ing program has become establ ed in our school program. The d ils of filing, shorthand, typing, book ep-ing, etc., are thoroughly taugh so that when a boy or girl gra ate comes into your office from igh school, he or she is equipped ith the basic knowledge of office pro ed-ure and becomes an asset in the office. At least he or she partly earns the wages paid.

PAPER PRESENTED to STUDENTS to AROUSE INTEREST in MASONRY TRADE

A RECENT SURVEY showed that pupils enrolled in our industrial arts program were interested in learning more about the related building trades. In an effort to partially meet this expressed request, the industrial arts department is pleased to present, through the cooperation of Mr. Ralph Condo, "assistant teacher," an introduction to the *Art of Masonry*.

Art of Masonry

What are you going to do when you graduate?

Some folks start out in life by just "taking" a job. The more thoughtful ones plan a career. Their choice of a vocation is based on what they enjoy doing most plus the opportunities offered that will enable them pleasantly and profitably to achieve their goal. Young men with ambition, energy and determination are the type most welcome in the Art of Masonry. These few lines are dedicated to acquainting the young men of Somerville High School with what masonry has to offer in the way of an occupation with security, comforts, luxuries and a high standard of living.

Have you ever thought of the construction industry as a career?

At home as a boy, did you work with tools and make simple home repairs? Did you get a thrill out of building things? Perhaps you have used the trowel and masonry materials in these odd repair jobs. If you have had an interest in construction and like to work with hand tools, masonry should appeal to you.

Consider masonry as a life work.

The future of masonry is brighter today than at any time in its centuries long history. Down through the ages the mason has been highly respected and honored. His trade has changed but little. For once the mason has mastered the elements of his trade and acquired proficiency and skill, it is "his trade" for the rest of his life. There are no great and frequent changes in masonry. A man learns his job, knows it, and does it throughout his lifetime. With the construction industry today facing a long period of expansion, the mason should be able to look forward to a secure, permanent, successful future.

Here are the basic requirements for masonry.

The mason is a skilled craftsman who lays brick, tile, terra cotta and building block in many and varied types of construction work. He spreads mortar, cuts and lays brick, tile, or other masonry units, and tools the mortar joints in masonry walls, piers, pilasters, arches, and other types of structures. The mason works from blue prints or follows oral instructions and directions. The tools most often used are the brick trowel, brick hammer, brick chisel, pointing trowel, steel square, short level, plumb bob lines, folding rule, and several types of jointers.

Your earnings will be among the highest in the construction industry.

Your financial returns as a mason will provide you with a good living right at the start. On most construction jobs the mason draws the biggest hourly wage. In direct comparison with other skilled craft —plumbers, electricians, painters, printers, machinists—the mason is in the "upper" wage earning bracket. The mason is a substantial citizen. Many own their own homes. The mason's standard of living is on a high level. He is respected and admired by his fellow men for his industry, his position, his craft, and the security that his work provides.

There are no limits to your opportunities.

When you have completed your apprenticeship, you will be a qualified mason. As a journeyman mason, you can begin your climb up the ladder of success. There will be a place for you in almost any locality in which you may wish to live, for the mason is not confined to specific areas. You will have established yourself as a craftsman. Your possibilities are unlimited. As a mason, you will earn high hourly wages with a 35- to 40-hr. work week. You will receive time and one-half or double time for overtime.

The next step, with ambition, enterprise, and some hard work, is to a position of foreman. Here qualities of leadership, ability to supervise, good judgment and initiative will provide you with excellent opportunities, plus a substantial increase in your pay.

Near the top of the ladder and well within your reach is the highly respected and profitable position of private contractor. Twenty percent or more of all mason contractors were formerly masons. It requires but little capital other than your experience, sound understanding of your trade, and ambition to become a contractor. Here your income possibilities are unlimited.

Masonry mechanics often supplement their training by learning to be plasterers, stone masons, tile setters, cement masons, marble masons, stone setters, and other related occupations, particularly in smaller communities. Learning one or more related trades makes you a more valuable craftsmen.

You will work in a healthful environment.

Your work week will vary from 35 to 40 hr., according to the locality. In good weather you will work outdoors in sunshine and fresh air. Accidents and occupational injuries are at a minimum in masonry. Many masons continue actively in the trade long past the age of 70.

You will be steadily employed.

The mason's work is not as seasonal today as it was a few years ago. Improved construction conditions and methods plus the tremendous building program in private and government construction ahead assures more regular week-in and week-out employment. New technological developments in the field of masonry products have increased the demand for interior masonry work, which will create more continuous employment during the bad weather periods.

Need for men in the masonry trade.

The need for men in the masonry trade is great. With all the planned construction for the future, men in the trades will be gainfully employed for years to come. For the first time in many years it is possible for young men to begin this interesting craft at a substantial starting pay and with a short period of apprenticeship. Why not investigate what this trade and the related trades have to offer you?

How can you learn more about masonry?

Your first step is to consult with your school's vocational guidance counsellor or the principal. They will help you and furnish full information.

Your second step is to talk and visit with those who are associated in the masonry trade. First hand information will help you to understand fully the possibilities open to young men who are seriously interested in making masonry their life work.

Picture yourself employing a girl in your office who had no knowledge at all of business education. How long do you suppose it would take you to teach her shorthand, typing, filing, etc.? Imagine how long it would be before she would prove an asset to your company.

We do not have any vocational school in Somerset county and my thought was that we might follow the same principle in teaching the fundamentals of the art of masonry in our high school that is followed in the teaching of business techniques. We could teach only the boy who is interested, and the teaching would have to be limited to the fundamentals of the trade. We could not attempt to turn out full-fledged craftsmen from high school anymore than we could turn out doctors and lawyers. Before becoming a mason, the boy would still have to serve his apprenticeship.

When I say that I think the fundamentals of the trade are essential I mean that a good craftsman should not only know how to work with his tools, but that he should know every detail of the job he intends to do. For instance, a welder should not only know how to weld, but he should also know if the metal he is welding is hard or soft steel, cold or hot-rolled steel and the type of welding rod and flux he should use. A carpenter should not only know how to handle his tools but he should also know the type and quality of the wood he is working with. By the same token, a mason should know the basic ingredients in cement, why it sets when mixed with water, how much lime should be required in making a plastic mortar to bond a given unit properly. Further, he should know how much sand and the proper grade to use in a mortar, and he should be familiar with the practice of volume measurement in terms of sand, cement and lime and the importance of knowing the exact amount of each to use in the construction of a wall.

We have so-called masons who use the shovel to measure their sand. Yet, many of them do not know the size of the shovel, or how many shovels full to use to the sack of cement and many are unaware of many other basic principles in the art of masonry that should be known before the mason is taught the use of his tools. All of these things can be taught in high school to the boy who shows a natural inclination toward the trade. I am certain there are many boys in high school who will jump at the opportunity to learn the fundamentals of masonry if it is presented to them, since masonry is an art that commands the respect of the community and the man's associates.

Incentives

Many outstanding men have worked as masons. Through the centuries prominent world leaders have emerged from the ranks of masonry. George Washington loved the creative accomplishments of building. Winston Churchill sought inspiration in the pursuit of brick laying during the war years. John W. Studebaker has gained world recognition in the field of education. He rose from a brick mason to become United States Commissioner of Education. Harry C. Bates came up from a mason to be a leader of organized masonry as president of the Bricklayers, Masons and Plasterers International Union of America.

It is a healthful trade. Masons work from 36 to 40 hr. a week in fresh air and sunshine. Many masons continue actively in the trade long past the age of 70.

Masons draw about the highest hourly wages among tradesmen. In direct comparison with other skilled crafts, including plumbers, electricians, painters, printers, machinists and carpenters, the mason is in the upper wage-earning bracket. The concrete masonry industry has much to offer our American youth by virtue of its growth and acceptance of its product and at the same time it can protect itself in the future by offering the buying public a better masonry job. The concrete masonry industry has only begun to scratch the surface of its potentialities of better and more buildings of masonry for the future. The home of tomorrow, it is my belief, will have concrete, metal and plastic as the basic building materials.

My efforts in selling my community on the idea of teaching masonry fundamentals in the high school have been very gratifying. Since we are very fortunate in having a high school board of very capable and understanding gentlemen, it was a rather easy matter to convince them of the importance of using our high school as the foundation for building a younger generation of capable craftsmen to serve our fast-growing construction industry.

Selling the Student

Since we are using the taxpayers' money to educate our children, the opportunity to have students taught to become tradesmen is of course not limited to masons but might be permissible to other crafts. My next job was to sell our high school students on the idea. With the permission and assistance of our high school vocational director, I appeared before several high school groups and spoke to them on the advantages of choosing the art of masonry as their vocation. I spoke briefly on the highlights of the trade, because of time restrictions. However, realizing that a boy of 17 or 18 could not possibly remember and absorb what I had said during this short time, I prepared a detailed paper on the advantages of the trade. Each boy received a copy with instructions to take it home, study it carefully and consult with his mother, father and friends so that he could fully understand it and be prepared to ask questions at a later meeting. This paper outlining advantages of the masonry trade is reproduced here.

High School Course

Those who are interested in the subject may apply for the course to their vocational director and then be enrolled. During the freshman and sophomore years the students will be screened and checked as to their earnestness, natural inclination and health before they are permitted to carry on the course. During the senior year the student will learn the use of masonry tools which will be furnished by my company, James Condo and Son. Until such time when our school board will employ a certified teacher, it is my responsibility to be the instructor, and I have been appointed an assistant teacher in order to comply with some legal technicalities. I propose, as a project, to build a retaining wall along a brook running through our city park, close to my plant.

Union Support

As to how the union delegates react to the idea, the answer is obvious. Since the duties of the union delegate and his salary depend on union members, it is to his interest to support the idea because in a short while, as things are now, he will not have many members left. I am happy to say that union delegates are heartily in favor of the idea and willing to help.

In inaugurating this idea, I am greatly indebted to Dr. Sampson Smith, County Superintendent of Schools; Dr. William Lawrence, supervising principal of Somerville High School; John Poliacick, vocational director of the school; and the Somerville Board of Education—who saw fit to spend the taxpayer's dollar for a worthy education.

Steam-Curing Systems

"Shore Engineered Steam Curing Systems" is a recent bulletin published by Shore Engineering, New York, N.Y. It contains illustrations of high pressure steam-generating units; lightweight, insulated, steam curing kilns; and lightweight, insulated kiln doors. It also shows installations made at various places in the U.S. Copies of the bulletin may be obtained from Shore Engineering, 320 Broadway, New York 7, N.Y.

Vermiculite Booklet

Zonolite Co., Chicago, Ill., producer of vermiculite, has announced the publication of a 12-page illustrated booklet, "Roof Decks and Roof Insulation." The booklet describes vermiculite concrete and its use in various roof constructions. Physical properties of this concrete and specifications for several types of insulation are listed. The booklet may be obtained free of charge by writing to Zonolite Co., 135 S. LaSalle St., Chicago, Ill.

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PIPE MANUFACTURERS DISCUSS TECHNICAL PROBLEMS

Operating problems and various methods of pipe manufacture highlight combined association meeting in Chicago

THE AMERICAN CONCRETE Pipe Association held its 44th annual convention at the Drake hotel, Chicago, Ill., on February 27 to March 1, 1952. The meeting was well attended in spite of related conventions being held simultaneously in other cities. The first day was devoted to the American Concrete Pressure Pipe Association, its third annual convention. As in the past the attendance was marked by the number of wives who accompanied their husbands to the annual meetings. Harold F. Peckworth is managing director for both associations, assisted by John G. Hendrickson, research engineer, and T. K. Breitfuss, engineer.

Ivy H. Smith, Sherman Concrete Pipe Co., Jacksonville, Fla., was elected president of the American Concrete Pipe Association. Vice-presidents elected were: Hugh P. Ford, Eugene Concrete Pipe & Products Co., Eugene, Ore.; Elmer Leuliette, Universal Concrete Pipe Co., New York, N.Y.; and James Carnwarth, Concrete Pipe Ltd., Toronto, Ontario, Canada. David A. Decker, Mid-West Concrete Pipe Co., Chicago, Ill., was elected secretary; and J. D. Mollendorf, Continental Concrete Pipe Co., Chicago, Ill., was elected treasurer.

Directors elected, with terms expiring in 1955, were: Louis F. Dolch, Dolch Concrete Pipe Co., Dallas, Texas; Edwin H. Fox, Cincinnati Concrete Pipe Co., Reading, Ohio; and Lloyd S. Stroud, Stroud-Seabrook, Inc., Bakersfield, Calif. Directors with terms ending in 1954 are: G. D. Williamson, Valley Concrete Pipe & Products Co., Inc., Yuba City, Calif.; Thomas E. Arp, Sherman Concrete Pipe Co., Inc., Knoxville, Tenn.; and Claude J. Kelley, New Orleans Cement Products Co., New Orleans, La. Directors with terms ending in 1953 are: Harry W. Heath, Lock Joint Pipe Co., East Orange, N.J.; J. A. Dunn, Hume Pipe of New England, Inc., Swampscott, Mass.; and Earl H. Eby, Elk River Concrete Products Co. of Montana, Helena, Mont.

The board of governors of Concrete Pipe Associations, Inc., is as follows: P. R. Hirsh, Harry S. Price, Jr., Ivy H. Smith, Edwin H. Fox, Gilbert D. Williamson, and A. C. Clarke.

Wednesday was devoted to the American Concrete Pressure Pipe Association, the afternoon session opening with its third annual business session, president P. R. Hirsh, presiding. The only speaker for the day was Louis R. Howson, consulting engineer, Alvord, Burdick & Howson, Chicago, Ill., who spoke on his experience with concrete pressure pipe.

The following officers and directors were elected for 1952: P. R. Hirsh, Lock Joint Pipe Co., East Orange, N.J., president; R. V. Edwards, American Pipe & Construction Co., Los Angeles, Calif., vice-president; and Harry S. Price, Jr., Price Brothers Co., Dayton, Ohio, secretary-treasurer.

Directors elected were: P. R. Hirsh, R. V. Edwards, Harry S. Price, Jr., Ray A. Foley, Gifford-Hill American Inc., Dallas, Texas, and E. L. Johnson, Concrete Conduit Co., Colton, Calif.

Thursday was devoted to a condensed version of the Short Course School of Instruction paralleling the course given recently at the Edgewater Beach hotel, Chicago. At this latter school the attendance was mostly operating men, plant superintendents, etc., and it was felt that some plant owners and executives might profit by repeating some of the classroom sessions.

The morning session was under the chairmanship of Edwin H. Fox, president of the American Concrete Pipe Association. The first talk was an informal one by Elmer Leuliette, Universal Concrete Pipe Co., New York, N.Y., who discussed the manufacture of tamped pipe. Mr. Leuliette emphasized the need for a high percentage of gravel in the concrete and prewetting slag when it was used as an aggregate. Frost in aggregates causes "fall-outs."

Mr. Leuliette discussed the causes of torsion cracks in reinforced tamper-made pipe and said that carrying more gravel would help eliminate such cracks. He mentioned using 800 lb. of sand and 1000 lb. of crushed stone as a suitable mix. During summer months he recommended the use of half-batches to minimize the effects of evaporation and he preferred No. 6 or No. 7 wire for the uprights. He illustrated the need for more gravel by means of a sponge, saying sand tended to act similar to a sponge and sand did not add much to the concrete's strength. He pointed out that in the tamper process the concrete goes into the forms to make essentially a spiral, and a study of the operation with these facts in mind could help reduce torsion cracks. He said this type of crack can show up 2 to 3 hr. after the pipe is made.

Board of direction, American Concrete Pipe Association, for 1952; Ivy H. Smith, Sherman Concrete Pipe Co., Jacksonville, Fla., front center, is the new president. Clockwise from Mr. Smith are Howard F. Peckworth, managing director of the association; Joseph A. Dunn, Hume Pipe of New England, Inc., Swampscott, Mass., director; Thomas E. Arp, Sherman Concrete Pipe Co., Inc., Knoxville, Tenn., director; Elmer Leuliette, Universal Concrete Pipe Co., New York, N.Y., vice-president; Claude J. Kelly, New Orleans Cement Products Co., New Orleans, La., director; James Carnwarth, Concrete Pipe, Ltd., Toronto, Ont., Canada, vice-president; Louis F. Dolch, Dolch Concrete Pipe Co., Dallas, Texas, director; Harry W. Heath, Lock Joint Pipe Co., East Orange, N.J., director; J. D. Mollendorf, Continental Concrete Pipe Co., Chicago, Ill., treasurer; Edwin H. Fox, Cincinnati Concrete Pipe Co., Reading, Ohio, director; Earl Eby, Elk River Concrete Products Co. of Montana, Helena, Mont., director; Hugh P. Ford, Eugene Concrete Pipe and Products Co., Eugene, Ore., vice-president; Gilbert D. Williamson, Valley Concrete Pipe and Products Co., Inc., Yuba City, Calif., director; and David A. Decker, Mid-West Concrete Pipe Co., Chicago, Ill., secretary

Centrifugal Pipe Manufacture

The next instructor at the school was Joseph A. Dunn, past president of the American Concrete Pipe Association, and president, Hume Pipe of New England, Inc., Swampscott, Mass. He described briefly the Hume centrifugal pipe manufacturing process and described the various methods of reinforcing this type of pipe. On the blackboard, Mr. Dunn gave a tabulation showing the pressure per square inch developed by the centrifugal machine. This tabulation was as follows:

2500 peripheral ft./min.

Pipe size (in.)	24	48	72
r.p.m. of case	398	199	133
p.s.i.	15.5	13	12

3500 peripheral ft./min.

Pipe size (in.)	24	48	72
r.p.m. of case	557	278	186
p.s.i.	30.5	25	24

In the Hume process a steel cylindrical casing is spun horizontally. At the time the concrete is fed to the machine the speeds are relatively slow as indicated in the first set of figures. Later the r.p.m. of the case is increased. This compacts the concrete into a dense mass and squeezes out considerable water even though the slump at time of placing is in the 1½- to 2-in. range. This water, while small in amount, can present a disposal problem for it is a thin slurry holding some of the lighter sand particles in suspension along with a small amount of portland cement. It is wasted.

Mr. Dunn showed an interesting moving picture of the entire process and said that in his opinion spun pipe was the best pipe manufactured. He used a crushed trap rock aggregate explaining that any aggregate used should be uniform in specific gravity, for in the spinning operation any lightweight material does not compact readily. As an illustration of the type mix used he mentioned that for a 72-in. extra-strength concrete pipe: 550 lb. of portland cement, 11 cu. ft. of sand, 5.6 cu. ft. of ⅜-in. crushed stone, 8.2 cu. ft. of ¾-in. crushed stone. The trap rock or gneiss had a sp. gr. of 2.93.

He recommended a fast bleeding coarse ground portland cement with a surface area of 1600 sq. cm. per g. and explained that the coarser ground cements permitted a quicker elimination of the excess water. He said high early cements had a surface area of 2100 to 2200 sq. cm. per g. and that standard cements were in the 1800 sq. cm. per g. range. He said air-entraining cements were undesirable as they fluff, and come to the inner surface of the pipe. He said that they got blisters in the pipe from the use of slow-bleeding cements. The speaker described the general methods of holding the reinforcing wire in the steel casing, which consisted essentially of cutting a wire here and there, bending it outward so that it held the reinforcing cage away from the steel cylindrical form a pre-determined distance. For elliptical cages he drew sketches of how the wires were cut and wire segments of the cage incorporated to form a truss. The form oil used is a non-scouring, fast drying soap, resin and oil mixture or the so-called Hume pipe oil.

During the showing of the moving picture Mr. Dunn explained the general techniques and showed how "splits" and shorter lengths of pipe could be made by the Hume process. He said Tylock joints were used and that he made pipe up to 8 ft. long but only stocked the 4-ft. lengths. He said the trend was toward longer pipe.

Packerhead Process

The afternoon session was presided over by Henry Shaw, president, North Carolina Products Corp., Raleigh, N.C. Carl A. Bluedorn, Zeidler Concrete Products Machinery Co., Waterloo, Iowa, described the packerhead process, first giving a brief history of the process. On design of mix, Mr. Bluedorn gave what he felt was a good gradation for the sand:

Passing No. 4 screen	95-100	percent
Passing No. 8 screen	80-95	percent
Passing No. 16 screen	65-85	percent
Passing No. 30 screen	30-50	percent
Passing No. 50 screen	10-25	percent
Passing No. 100 screen	2-10	percent

He said that he had never seen a sand with 10 percent minus 100 mesh in his area and that one might have to add fine bank sand or fly ash, or make up for the fineness deficiency by adding more portland cement. For gravel he recommended No. 4 up to ¾ in., but felt that a top size of ⅝ in. was better suited to the packerhead process. For small, non-reinforced pipe the mix could be as rich as 1:3, 1:4 on the larger sizes (by weight), and 2.5 to 2.8 gal. of water per sack of cement was usual, he pointed out. For reinforced pipe a leaner mix (1:5) could be used. A typical mix would be one sack of cement, 340 lb. of sand, 130 lb. of gravel.

The talk by Mr. Bluedorn paralleled a similar one by the same speaker at the previously mentioned short course, except that he incorporated in the later paper some of the questions and answers at the first school. Some of this revolved about the use of gravel vs. crushed stone and he said he used mostly gravel but had used limestone.

On methods of determining the optimum amount of water for the mix, Mr. Bluedorn's was to "eye" the mix as it came over the top and observe if the concrete shows a wet web surface as it leaves the back part of the mixer. Next, rub a polished surface like a piece of tin or glass and if it produces a good water web when rubbed hard on the surface, the water content should be about right. Another method, he said, was to take a hand-full of the concrete and press it into a ball about the size of a tennis ball. If it has the right amount of water for the packerhead process, one can break the ball in half. On reinforcing, the speaker said he used 7-gauge wire entirely, with 6-in. spacing on transverse wires.

The speaker said that twisting of cages causes cracks and that often this was due to overfeeding concrete. For curing at ambient temperatures of less than 50 deg. F., Mr. Bluedorn recommended 48 hr. of low pressure moist curing. Temperatures between 100 and 160 deg. F. were acceptable, in the speaker's opinion.

Mr. Bluedorn stressed the continual checking by measurements of pipe and showed the group a set of calipers that he used to measure wall thicknesses and a minimum diameter measuring rod with which he checked inside dimensions.

He said that once in a while he ran into trouble with burning or crazing

Enjoying the A.C.P.A. banquet. Left: (clockwise) H. H. Dickehut, Acme Concrete Pipe Co., Corpus Christi, Texas; Mr. and Mrs. G. W. Black, Black & Brollier, Houston, Texas; Mr. and Mrs. T. D. McGinnis, Bayou Concrete Pipe, Houston, Texas; Mr. and Mrs. George Denham, Faulkner Concrete Pipe Co., Hattiesburg, Miss.; Mr. and Mrs. B. L. Dickehut, Acme Concrete Pipe Co., Corpus Christi, Texas; and Mrs. H. H. Dickehut. Right: (clockwise) John Porter, Gifford-Hill Pipe Co., Dallas, Texas; William B. Freeman, Lock Joint Pipe Co., Denver, Colo.; Harry S. Price, Jr., Price Brothers Co., Dayton, Ohio; Mrs. P. R. Hirsch; O. H. Miller, Jr., Choctaw, Inc., Memphis, Tenn.; Mrs. H. S. Price, Jr.; O. H. Miller, Choctaw, Inc., Memphis, Tenn.; J. W. Porter, Gifford-Hill Pipe Co., Dallas, Texas; Mrs. W. B. Freeman; and P. R. Hirsch, Lock Joint Pipe Co., East Orange, N.J.

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of the pipe. This comes about, he felt, because of hot cement or too dry a mix, though some brands of cement created more heat than others. If the packer cheeks are not set out, or the packer ring worn to the point that it has a reverse taper and is dragging, it will generate heat or, for some reason, the packer might run in one groove too long, which also generates heat. He recommended the use of a water spray on the machine as it would add 25 to 50 percent to the life of the wearing parts. The water acts as a lubricant and gives a dense and smooth interior.

He gave as typical life expectancy of cheeks and rings on 8-in. sewer pipe having ⅞-in. walls, 700 ft. of pipe for a set of two cheeks, and 5000 ft. for an 8-in. ring. On 24-in. reinforced pipe, the four cheeks will run about 1200 ft. and a ring will run about 10,000 ft. He recommended that the cheeks be set out every 30 pipe on the 8-in. sizes, and every 50 pipe for the 24-in. size. He described a "two operation" on the packerhead as first building the pipe (but not too heavily), and then going back down through it the second time with a little more concrete. He said by the use of the double operation one got a better looking pipe. He said that 4-in. pipe was the smallest he made, though he did have equipment to make 3 in., but had never used it. He said it did not take any more horsepower for the second pass.

Cast Pipe Manufacture

The next paper was by Walden Wren, production engineer, Universal Concrete Pipe Co., Columbus, Ohio. He said that possibly 95 percent of the pipe men in the country made cast pipe at one time or another and that the modern trend was to use that system for large sizes of pipe, such as the 120-in. units. He reviewed how the forms and end rings should be carefully handled and concluded his classroom instructions by showing a series of slides showing typical methods of handling the forms, placing the concrete and other steps involved in the manufacture of cast pipe. The speaker felt that batching by weight was better than batching by volume and that concrete in being placed should not have a free fall over 4 ft. because of the danger of segregation. He said a square steel rod in an electric drill made a good vibrator for wet concrete. He described the use of internal and external vibrators and thought that an internal vibrator should not be used while filling the form, for it would cause segregation.

On the subject of curing the speaker said that curing compounds were being used successfully and that leaving pipe standing on end often eliminated longitudinal cracks. He suggested the use of struts or jacks for large diameter pipe laid, hauled or stored horizontally. Elliptically reinforced pipe should be stored in its proper position, he said.

P. R. Hirsch, Lock Joint Pipe Co., East Orange, N.J., president of the American Concrete Pressure Pipe Association, left, chats with E. Cornelius, Stanton Iron Works, Nottingham, England

In the discussion it was asked if gravel or crushed stone made the better concrete for pipe. E. F. Bespalow replied that crushed stone added 18 to 20 percent to the strength of the concrete.

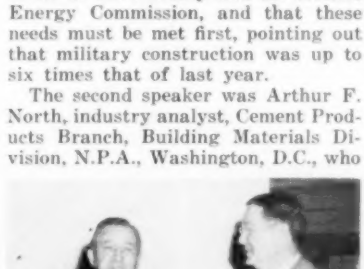
The day's meeting closed with the showing of a moving picture showing the jacking of pipe at an Iowa construction job. T. K. Breitfuss, engineer assistant of the association, explained some of the features involved.

Government Regulations

President E. H. Fox presided at the final meeting. The first speaker was Delmar G. Runner, chief, Cement Products Branch, Building Materials Division, National Production Authority, Washington, D.C., whose subject was "CMP and Concrete Pipe." He outlined the part the N.P.A. is playing in the defense set-up, saying the program was designed to restore our over-all military strength without upsetting the general economy. The speaker said the cement industry was healthy but that requirements for steel, copper and aluminum were much in excess of available tonnages and that screening was therefore necessary.

He said the construction outlook for 1952 was cloudy because of the needs of the military and the Atomic Energy Commission, and that these needs must be met first, pointing out that military construction was up to six times that of last year.

The second speaker was Arthur F. North, industry analyst, Cement Products Branch, Building Materials Division, N.P.A., Washington, D.C., who amplified the statements of the previous speaker. He gave the reason for the defense set-up and the steps taken to organize the allocation of materials.



Retiring president of American Concrete Pipe Association, E. H. Fox, Cincinnati Concrete Pipe Co., Reading, Ohio, left, receives a plaque from president-elect Ivy H. Smith, Sherman Concrete Pipe Co., Jacksonville, Fla.

Mr. North explained that the first six months of 1950 were arbitrarily taken as the base period, pointing out that actually the base period selected had nothing to do with the tonnage of steel available. To illustrate: if 100,000 tons of steel were used during the base period and there were now only 80,000 tons available, the allocation would be on the basis of 80 percent. Further, if 160,000 tons had been used during the base period and only 80,000 tons available, the allocation would be 50 percent. The speaker said that foreign steel could be used, but small reserves had been set aside for new companies and that enlargements of older companies would be studied carefully. He advised those who contemplated new operation, or additions, to first contact N.P.A. in Washington, D.C. The speaker told of a case where the military had sold steel direct to manufacturers where some item was badly needed, but such amounts must now be deducted from allotments. He felt that any successful attempts at evading the purpose of the allotment program would soon result in corrective legislation.

Florida Pipe Project

The next speaker was Paul E. Langdon, partner, Greeley & Hansen, consulting engineers, Chicago, Ill., who told of his experiences with reinforced concrete pipe with special reference to the work recently completed at Tampa, Fla. He gave a history of Tampa's growth and the need for a more efficient sewage system. Most of his talk had to do with the behind-the-scenes work going into the construction of a large metropolitan sewage construction job.

On the job under discussion the 24-in. and smaller pipe were not concrete, but all larger than 24 in. were reinforced concrete pipe. He discussed the legal, financial and engineering aspects of the work. On a dollar basis he said that $3,500,000 represented concrete pipe work and $3,100,000 for other types of pipe.

Following Mr. Langdon was G. M. Hite, chief construction engineer of the same firm of consulting engineers, who told of the construction features and illustrated some of the work by slides. He said that most of the concrete pipe were bedded on a substantial bed of crushed stone and later surveys showed that this kept the pipe lines true to grade and in line. The pipe used were mostly tongue-and-groove, and three different types of rubber gaskets were used. There were some 3000 ft. of 78-in. pipe laid in a trench about 20 ft. under water. He emphasized the good work done by one contractor who used a backhoe for digging a trench and then used the same unit to place a 16-ft. length of pipe in the same short trench. The backhoe set the pipe in place and no

comealing was used. The skill of the operator of this machine played an important part in its success, the speaker said.

J. W. Porter, Gifford-Hill Pipe Co., Dallas, Texas, asked about the effectiveness of rubber gaskets without mortar. It was pointed out that a rubber gasket to be effective must be in compression all around.

Open Forum

Saturday afternoon was devoted to the ever-popular panel discussion. The panel consisted of E. F. Bespalow, Choctaw, Inc., Memphis, Tenn.; C. A. Bluedorn, Zeidler Concrete Products Machinery Co., Waterloo, Iowa; George B. Denham, Faulkner Concrete Pipe Co., Hattiesburg, Miss.; Henry A. Weigand, United Concrete Pipe Corp., Baldwin Park, Calif.; H. W. Chutter, Jourdan Concrete Pipe Co., Fresno, Calif.; Henry C. Eames, New England Concrete Pipe Corp., Newton Upper Falls, Mass.; and Henry O. Strohecker, Jr., Carolina Concrete Pipe Co., Inc., Charlotte, N.C. E. H. Fox acted as moderator.

One of the first questions asked was whether or not problems relating to sales and merchandising could be made a subject at the next Short Course School, especially data on technical sales. It was requested that all members write in their questions quite some time in advance.

A member asked what is the proposed "fill test"? It was explained that this related to a proposed method of testing concrete pipe, which consisted essentially of standing the pipe on a soft rubber mat, weighting it down if necessary. The pipe is next filled with water and the leakage noted after 15 min. The test would eliminate the hydrostatic test. One man suggested that it should be called the "permeability test."

Mr. Chutter said he used the test four times per day to check his own production. It was also brought out that the test was so simple that producers should use it. It was evident that the hydrostatic test was not in the general production program of most operators, mainly because of the cost, time-consumption and expense. On this proposed test, which evidently is in use in the Northwest, it is proposed to test 2 percent of the pipe, that is, two lengths of pipe in each 100. Under the hydrostatic system only one pipe in 800 is tested, it was said.

James Carnwarth, Concrete Pipe Ltd., Toronto, said comparisons should be made between pipe tested by "fill" method and by the hydrostatic to make sure that the fill test would show up defective pipe. One member answered by saying he had used both methods for years and that the fill method was a satisfactory method of showing up poor pipe. It was also brought out in the discussion that when a pipe was filled with water a damp spot appearing on the outer surface of the pipe was not considered to be leakage or an indication of defective pipe, and that most often this damp condition became self-sealing. Another said he used the test by placing the pipe end-up on a mastic floor; even level concrete with a dirt seal would work all right for the fill test, it was pointed out.

Mr. Runner asked if reactive aggregates were a serious factor in the manufacture of concrete pipe and the answer was, generally speaking, no. However, Mr. Weigand said that in such cases where it had been called to his attention he used a low alkali cement. Mr. Chutter said both the Army Corps of Engineers and the Bureau of Reclamation would not let him use some aggregates except with a low alkali cement.

Elmer Leuliette asked if anyone could explain what "dead-water" meant and how it affected concrete pipe. A member asked if "pure water" was meant by this, as he had heard that pure water was violently reactive in some concretes. One possible explanation was given from the floor, that this water was high in carbon dioxide. In such cases it was pointed out that the water acted as an acid (carbonic acid, H_2CO_3) and this combined with the lime in the concrete to form lime carbonate. Hard water formed an insoluble compound with the lime in such cases and made a better concrete, it was said. A second speaker from the floor said that on a dam where fly ash had been used in the concrete, there had been some surface damage after six months due to high carbon dioxide content of the water, but after 20 years the initial damage had not increased. A structure in Virginia built by army engineers went bad, it was said, and the blame was placed on high CO_2 content of the water contacting the structure.

Mr. Bespalow said that if one wanted to see what carbon dioxide could do he should observe its damaging effects on cast-iron pipe. Mr. Porter suggested a research program tied in with an educational program should be set up to study the effects of hydrogen sulfide on concrete and he thought that the approach should be by first contacting the local cement mill executives who in turn would pass the problem on to the Portland Cement Association as a research program. Ivy H. Smith suggested that large industrial chemical companies such as du Pont were well equipped to deal with such a problem.

Considerable floor time was devoted to whether or not pictures showing clay pipe failures should be used as sales promotion methods. It seemed to be the general opinion that such pictures should be used by individual companies. It was also the decided expression of the men present at this session that the association should continue to give out production figures.

Some discussion revolved about A.S.T.M. changes and methods used to obtain them and it was brought out that such changes are usually made as the result of a consumer demand and not from a producer's demand.

A member asked if there were any forms that could be used to make "T's" and "L's" so as to replace the general method of cut-and-patch technique. Such forms could be had, but it was brought out that so many different form sizes would be required that the idea was not too practical. One member said if the patched joints were adequately cured they were stronger than the pipe, and one spoke of using curing compounds successfully for this work. Ernest Rowe, Canton Block & Tile Co., Canton, S.D., told of seeing a packerhead machine being used to make elbows and bends. It developed that the machine was a power-driven unit.

On the subject of curing, one member told of having copper tubing embedded in the floors of his kilns. The copper tubing was covered with 8 in. of concrete but still heat came up to the pipe so that on the coldest days the bottom of the pipe became warm, getting up to 80 deg. F. Under these conditions, it was further explained, live steam was injected into the kiln. He said that with cold pipe and the warm floor, plus low temperature steam, he could cure pipe in 6 to 8 hr. and meet the specifications.

The meeting closed with a request by Mr. Bluedorn that advertising papers, bulletins and literature be exchanged through the association. Mr. Chutter thought it would be a good subject to take up at a future meeting.

Luncheons and Entertainment

The ladies' program committee was headed by Mrs. E. H. Fox and consisted of Mrs. R. L. Bearss, Mrs. George W. Black, Mrs. J. A. Durgom, Mrs. R. V. Edwards, Mrs. Hugh P. Ford, Mrs. R. C. Graber, Mrs. P. R. Hirsh, Mrs. Harry Leuliette, Mrs. W. L. McDaniel, Mrs. J. E. Miller, Mrs. J. D. Mollendorf, Mrs. J. R. Newell, and Mrs. Harry S. Price, Jr.

Wednesday evening there was a cocktail party and reception at which time the members were guests of the Illinois concrete pipe manufacturers and manufacturers from nearby Gary, Ind. Friday the ladies were taken on an extended bus trip through Chicago, including a luncheon at a downtown department store. The noon luncheon for men featured an interesting talk by Countess Maria Pulaski, who told of her experiences as a spy for the Allies during World War II. Saturday noon was a general luncheon for both men and women, at which C. V. Amenoff, editor, *Elburn* (Illinois) *Herald* spoke. During the same evening the reception and banquet were held.

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New board of directors, American Concrete Agricultural Pipe Association, includes, l. to r., William B. Freeman, Lock Joint Pipe Co., Denver, Colo., treasurer; Elmer L. Johnson, Concrete Conduit Co., Colton, Calif., director; E. H. Eby, Elk River Concrete Products Co., of Montana, Helena, Mont., vice-president; George F. Lillie, Platte Valley Cement Tile Mfg. Co., Scottsbluff, Neb., secretary; Gilbert D. Williamson, Valley Concrete Pipe and Products Co., Yuba City, Calif., director; and J. W. Porter, Gifford-Hill Western, Inc., Dallas, Texas, president

Agricultural Pipe Association Meeting

THE AMERICAN CONCRETE AGRICULTURAL PIPE ASSOCIATION held its second annual meeting at the Brown Palace hotel, Denver, Colo., on March 3-5, 1952. The meeting was well represented and many of those who attended the Chicago meeting of the American Concrete Pipe Association and the American Concrete Pressure Pipe Association were present. The West Coast was also well represented.

The first day and a half of the three-day meeting was devoted to association business. J. Walter Porter, Gifford-Hill Pipe Co., Inc., Dallas, Texas, was elected president of the association, succeeding G. D. Williamson, Valley Concrete Pipe and Products Co., Yuba City, Calif. Much of the program was built around the activities of the U.S. Bureau of Reclamation, Denver, Colo., and included an inspection of its extensive laboratories located at the Denver Federal Center. The visitors saw the laboratories' huge compression test machine break concrete cylinders of exceptionally large size. Luncheon was served by the Bureau of Reclamation.

Three papers were given. Frank A. Rippon, assistant chief of the Canals Branch, Bureau of Reclamation, spoke on "Concrete Pipe in Reclamation Work." Peter W. Terrell, assistant head of canals and pipelines section of the bureau, spoke on "Design of Irrigation Systems Using Concrete Pipe." The final paper was by Professor Dalton G. Miller, department of agriculture, University of Minnesota, whose subject was "Basic Requirements for Sulfate Resistant Concrete Drain Tile." The cocktail and dinner party was held at the Brown Palace hotel.

The following officers were elected in addition to the president: E. H. Eby, Elk River Concrete Products Co. of Montana, Helena, Mont., vice-president; George F. Lillie, Platte Valley Cement Tile Mfg. Co., Scottsbluff, Neb., secretary, and William B. Freeman, Lock Joint Pipe Co., Denver, Colo., treasurer. Gilbert D. Williamson, J. W. Porter, A. C. Clarke, and Elmer L. Johnson are directors.

Canadian Block Producers Meet

A TREND TOWARD a more scientific and exacting approach to making and marketing various concrete products was evident at the third annual convention of the National Concrete Products Association (Canada), held at Windsor, Ont. Little was said about foundation block at the well-attended sessions but much was said about exposed interiors, floors and decorative exteriors.

The architectural profession was well represented and instructive. H. Sheppard, Windsor, Ont., traced the history of architecture and stressed that it was important to understand the lessons of the past before attempting something new. In speaking of building, he regretted the lack of modular coordination.

A. D. Wylie, past president of National Concrete Products Association (Canada), left, congratulates president-elect W. C. Coupland

Shrinkage and expansion of masonry walls were also mentioned. Mr. Sheppard gave a figure of ⅛ in. shrinkage per 100 ft. if block were not preshrunk, and expansion up to ¼ in. per 100 ft. caused by extreme temperature difference. He suggested that two heavy wires laced together with lattice placed in the mortar proved helpful as reinforcement.

Philip C. Johnson, architect, London, Ont., suggested that there exists an undeveloped market for special made-to-order units. To make special units would require an extremely low capital outlay, but considerable imagination and artistic sense, he said.

Building Research

Prof. Robert F. Leggett, Division of Building Research, National Research Council, Ottawa, Ont., opened his remarks by warning against use of concrete products where other products are better, stating that there are too many good building materials used in the improper place. He then outlined what the Canadian National Research Council is and its progress.

Professor Leggett suggested a module of 4 in. and multiples thereof, but it would be necessary for architects, contractors and suppliers to agree before anything could be done, and at present this unanimity appeared hopeless.

The Canadian Standards Association has considered modular coordination, but no definite recommendation has been made by it. The over-all opinion was that while desirable, the question is in an extremely controversial stage and probably would be for many years hence.

The forum on lightweight concrete units pointed out the necessity of new sources of supply for lightweight aggregates. Brant Coleman of J. Cooke Concrete Blocks, Ltd., Aldershot, Ont., admitted a progressive deterioration of both quality and supply of cinders. Being forced to take too much rubbish with the few cinders they get, is resulting in either a poorer finished product or too high a cost due to extra grading and preparation of the aggregate.

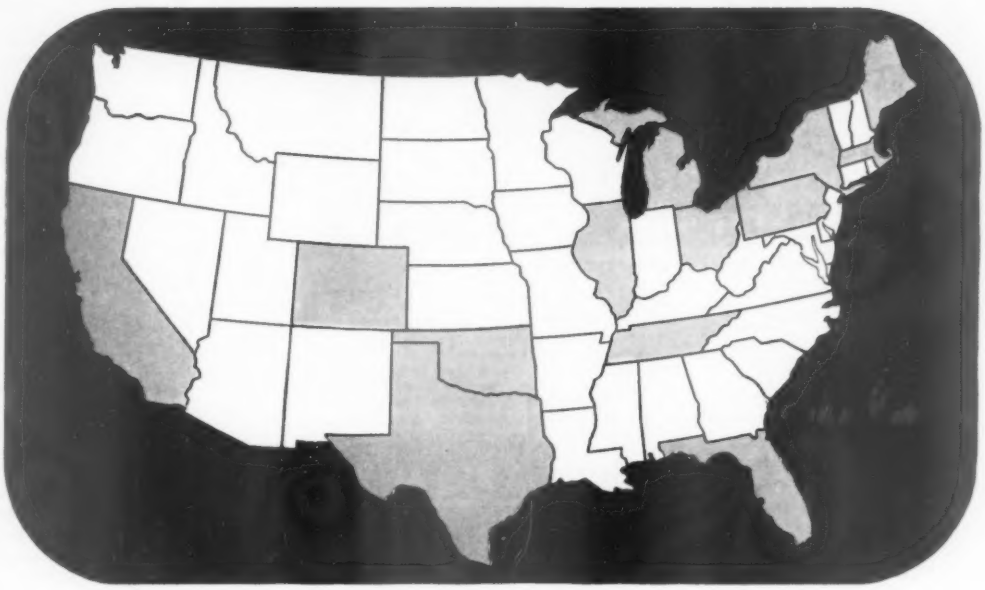
J. Pennachetti of Thorold Concrete Block Co., Ltd., Thorold, Ont., reported using imported Celocrete, but there is only a limited quota available.

E. Gross, Thermal Engineering Co., Detroit, Mich., presented a paper on steam curing. The effect of the steam force on entering the kiln, the effect of understeaming, timing, and cooling period were all dealt with and a clear explanation made of what change resulted to the concrete at the various stages, without which knowledge one could produce block brittle on the surface and soft inside, resulting in broken off corners and other defects.

Officers

W. S. Coupland, Argo Block Co., Ltd., Cooksville, Ont., was elected

PRESTRESSED CONCRETE



Now accepted from Coast to Coast

BRIDGES in Massachusetts, more bridges in Pennsylvania, a factory roof in Ohio, bridges and buildings in Tennessee, a ramp garage in California . . . these and scores of other construction jobs have been designed to use prestressed concrete. Every week more and more leading engineers investigate, then accept, this new material.

To meet the growing demand for the special tensioning members required, Roebling has developed a full line of new products. They are Prestressed Concrete Wire and Strand for pre-tensioning. . . Strand and Fittings for post-tensioning. Each has been developed to meet the special requirements of *any* prestressed concrete design.

Roebling Wire and Strand for pre-tensioning are made of high tensile acid steel that results in products of exceptionally high elastic characteristics. And they are specially treated to greatly increase their bonding quality, too.

Roebling Strands for post-tensioning are fabricated from special hot galvanized acid steel wire . . . insuring exceedingly high strength and elastic properties. At recommended stresses, there will be complete safety . . . no relaxation of the steel during the life of the structure. Our fittings develop the full strength of the strand without exceeding the yield point of any of their parts. They are attached at a Roebling plant and proof-loaded beyond recommended stresses. This factory-assembled method brings huge labor savings on the job.

Prestressed Concrete is growing by leaps and bounds. Keep abreast of the Roebling product developments. Write Prestressed Concrete Department, John A. Roebling's Sons Co., Trenton 2, N. J.

Roebling Prestressed Concrete Strand and its specially developed fitting which are available in a complete range of sizes from 5/8" to 1 9/16". With an inexpensive hydraulic ram, assemblies such as these can be brought to stress in a matter of minutes.

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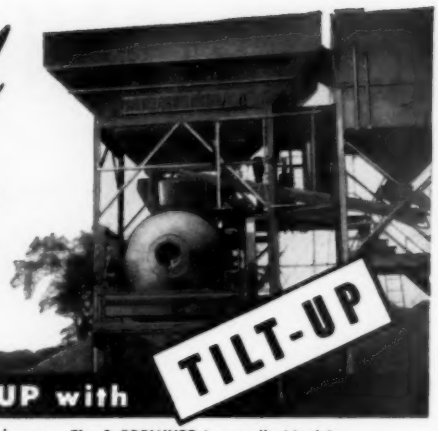
president for the coming year, succeeding A. D. Wylie, Economy Fuel Co., Hamilton, Ont. Garnet Fraser, Cross Paving and Supplies Ltd., Windsor, Ont., was named first vice-president; J. Pennachetti, Thorold Concrete Block Co., Ltd., Thorold, Ont. second vice-president; W. Kirkpatrick, Schell Industries Ltd., Woodstock, Ont., secretary; and Ross Cooper, Cooper Block Ltd., Toronto, Ont., treasurer.

Directors for 1952 include: J. F. Boux, Supercrete Ltd., St. Boniface, Man.; L.A.S. Bruce, Fraser Duntile Ltd., Ottawa, Ont.; B. Coleman, J. Cooke Concrete Blocks Ltd., Aldershot, Ont.; L. G. DeBrisay, Blakeny Concrete Products Ltd., Moncton, N.B.; J. Edwards, L. E. Shaw Ltd., Halifax, N.S.; Carson Luke, Paris Dunbrik Co., Paris, Ont.; A. Marker, Gus Marker Concrete Block & Tile Ltd., Kingston, Ont.; R. Mayotte, R. Mayotte Concrete Products Ltd., Fort William, Ont.; C. McLeery, McLeery and Weston Ltd., Vancouver, B.C.; P. McPherson, Storar Dunbrik Co., Ltd., Weston, Ont.; A. Miron, Miron Frese Ltd., Montreal, Que.; J. A. Russell, Edmonton Concrete Block Co., Ltd., Edmonton, Alta.; L. Ryan, Ryan Builders Supplies Ltd., Windsor, Ont.; D. Weldon, Weldon's Concrete Products, Saskatoon, Sask.; and R. B. Williamson, Pressure Pipe Co., Ltd., Montreal, Que.

Speed YOUR DEFENSE JOBS . . . and CLEAN UP with TILT-UP



The SuPREMIX *Expressway* Package helps you *push* those rush jobs through. This semi-portable central mix plant is readily moved from site to site, is doing a man-sized job everywhere. Eliminates long costly hauls. The Tilt-up feature of the 3-yard SuPREMIXER gives the Expressway an extremely low overall height of 37′ or less. And it's the only easily crane-fed central mix plant with 12′ clearance under the cone. Easy set-up and quick disassembly is a snap! Great for highway jobs, too. You save and *make* money with the SuPREMIX Expressway.

The SuPREMIXER is equally ideal for

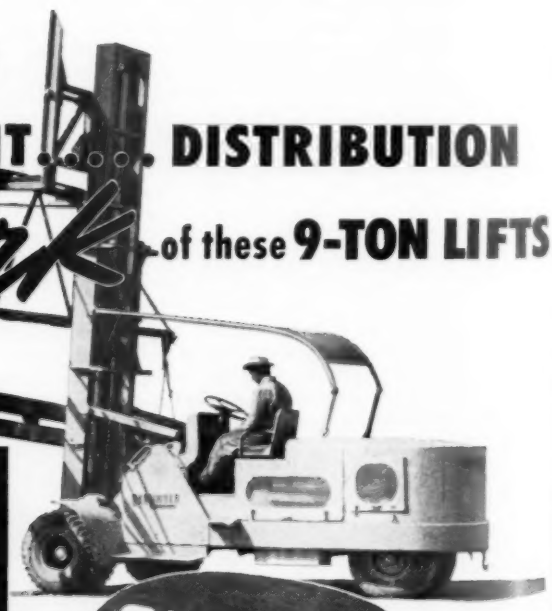
• Converting to Central Mix . . . the only mixer feasible in most existing plants. No need to raise your plant or lower drive since it requires less head room • Permanent Package Plants . . . designed and built by originators of the package plant idea. Reduced plant height means reduced construction, operation and maintenance costs • Write or wire for new bulletin and location of our representative near you.

SUPREMIX ADRIAN, MICHIGAN

402 GRACE ST. ADRIAN, MICH.

For modern, proven concrete block machinery, contact GoCorp.

GERLINGER'S COUNTER-ACTIVE WEIGHT DISTRIBUTION Makes Easy Work of these 9-TON LIFTS



Seattle Concrete Pipe Co. is manufacturing pre-cast concrete beams that weigh ten tons and are forty feet long. Moving these cumbersome units about the plant proved an easy job for their 9-ton Gerlinger Lift Truck.

Talbott Campbell, president, says. "Our Gerlinger Lift Truck does a very good job for us in the efficient handling of materials in our yard. We have had a very low upkeep expense on this lift truck during the time we have owned it."

The balanced weight distribution of a Gerlinger Lift Truck makes it particularly ideal for such off-size lifts. 54% of the truck's weight is where it's needed → —over the front wheels —for maximum traction and easy maneuverability. This is just one of the many exclusive job-proven features that enable Gerlinger Lift Trucks to out-perform all others in the most rugged handling jobs.

GERLINGER CARRIER CO.

G-246

GERLINGER CARRIER CO. DALLAS, OREGON

COMMENT
from the BUTLER ENGINEER

H-Bomb Baby Born at Butler Bin

I'm kind of a proud papa these days. Not to the point of stuffiness I hope; just walking around in a genial glow. But the baby *is* terrific and I simply have to tell you about him!

He's the control system we designed and built for the super-super automatic, completely interlocked, push-button operated Butler Central Mixing Plant which will pour concrete for the H-Bomb plant.

That baby was full grown at birth. Here's what he does:

He offers a choice of 5 predetermined batches at the turn of a selector knob. Hit push-button and batch starts. Filling gates open. Aggregates, cement and water flow until they reach exact weight. Each of 7 dials prints record of batch. Lights flash when balance is reached. Nothing can go wrong for it's all interlocked against every possible sin of omission and commission. A chimpanzee just hitting push buttons at random could turn out nothing but the right batch. Much more to tell but no room. Anyway, everything's as automatic as a trip to hell.

I'm afraid I stretched a point when I claimed sole parenthood. It always takes more than one to produce a baby. Here at Butler Bin all of us exchanged cigars at the birth for really everyone had a part in the conception. Sounds immoral, but you know what I mean.

Yours for that ounce of H-Bomb prevention,

The Butler Engineer

BUTLER BIN COMPANY
WAUKESHA, WISCONSIN

P.S. Want to see pictures of our baby? We'll be proud to send 'em. Just ask!

Autoclave Products Men Meet

AUTOCLAVE BUILDING PRODUCTS ASSOCIATION held an enthusiastic convention at the Roosevelt hotel in New Orleans on February 27-29. Under the chairmanship of Elmer R. Coats of the Mutual Materials Co., Seattle, Wash., assisted by Dale Cobb of Century Brick, Monroe, La., the program and arrangements had been well worked out and moved smoothly.

Warren Smith of Lone Star Cement Corp. predicted sufficient cement would be available for Autoclave Building Products Association members, although at periods of peak demand there may be temporary scarcity.

George McDearman, producer of "Claite" in Baton Rouge, La., described the operation of his long rotary kiln for efficient production of a bloated clay aggregate. By giving particular attention to providing sufficient fines, he is able to achieve outstanding results. For this purpose he uses a hammermill. He has produced 50 block from one bag of cement, all of which, with the help of autoclaving, tested above 900 p.s.i. In a batch from which 73½ block were obtained from one bag, all units tested above 700 p.s.i. It seems fairly obvious, as pointed out by Dr. Lansing S. Wells, National Bureau of Standards, Washington, D.C., that he is getting some pozzolanic activity.

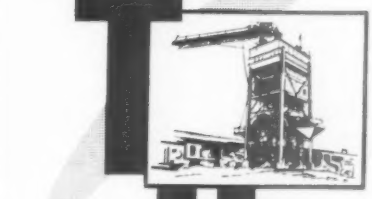
Mr. McDearman has so much demand for this aggregate that he said he could use a second kiln. He stated that he now has a method worked out for achieving considerable economies in kiln construction.

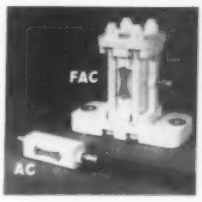
Noel D. Harter, Harter Marblecrete Stone Co., Oklahoma City, Okla., gave a brief progress report of the University of Toledo studies on moisture movement in concrete masonry units. These results will be published in detail later. However, the reduction in moisture movement by autoclaving was claimed to be subtantial. Mr. Harter then showed slides of his autoclave operation and gave details of his successful operation.

Haakon Paulson, Besser Manufacturing Co., Alpena, Mich., described the interest taken by his company in providing autoclaves for improving quality of block. The company is also engaged in designing a block which will show less shrinkage. Mr. Paulson said it was felt that the inclusion of a groove in the end tabs of the block, for the purpose of holding more mortar, will improve the chance of making tighter vertical joints.

Dr. F. O. Anderegg, consulting specialist on building materials, Somerville, N.J., described European autoclave building products studied on his recent European trip. (The special European issue of ROCK PRODUCTS appearing in May will contain this information, in addition to many other articles of interest to the rock prod-

STUCK





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Cleveland Air-Cushioned Vibrators are moving and settling a wide variety of concrete products in bins, hoppers, chutes and screens. They're doing it efficiently, they're doing it every day and they're doing it QUIETLY.

Catalog No. 108 will give you further details.

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- CENTRAL MIX PLANTS
- TRANSIT MIX PLANTS
- BULK CEMENT PLANTS (Portable and Stationary)
- AGGREGATE BATCHING PLANTS (Portable and Stationary)
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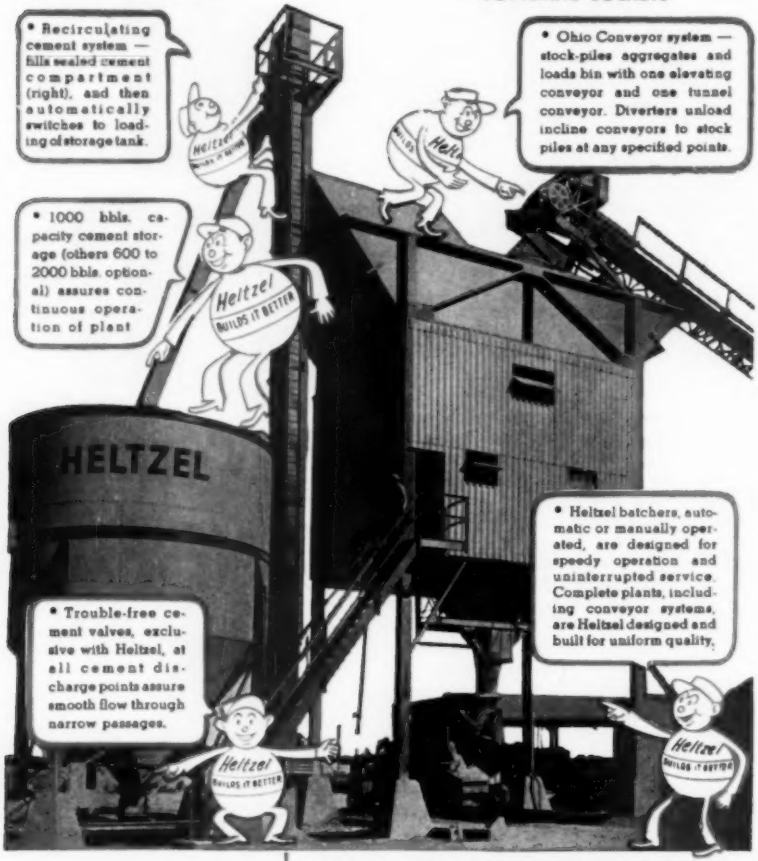
• Recirculating cement system — fills sealed cement compartment (right), and then automatically switches to loading of storage tank.
• Ohio Conveyor system — stock-piles aggregates and loads bin with one elevating conveyor and one tunnel conveyor. Diverters unload incline conveyors to stock piles at any specified points.
• 1000 bbls. capacity cement storage (others 600 to 2000 bbls. optional) assures continuous operation of plant
HELTZEL
• Heltzel batchers, automatic or manually operated, are designed for speedy operation and uninterrupted service. Complete plants, including conveyor systems, are Heltzel designed and built for uniform quality.
• Trouble-free cement valves, exclusive with Heltzel, at all cement discharge points assure smooth flow through narrow passages.

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WARREN, OHIO · U. S. A.

ucts and concrete products industries.)

Dr. Lansing S. Wells gave one of his interesting off-the-record talks. He is to prepare a paper to be given in London to a congress of cement chemists in September, in which he will describe his work on hydrogarnets, which seem to be produced in the autoclave from lime, silica and alumina.

R. S. Linford, general manager, Colortone Brick, Ltd., Melbourne, Australia, gave some remarks on the sand-lime brick industry in Australia. He has had difficulty in getting satisfactory lime, which he hopes to overcome with a lime plant of his own. He is in this country to acquire technical information on lime burning. A line of colored brick is produced by his company, Mr. Linford said, and great care is required to control the color.

Leo J. Ryan, president, Ryan Builders Supplies, Ltd., Windsor, Ontario, has been diversifying by making block and, more recently, floor and roof slabs with a standard block machine. These slabs are ground with a horizontal grinding machine and very excellent results have been obtained.

The need for getting into other products besides sand-lime brick was emphasized by Carl Miller of Pacific Brick Co., Pacific, Mo. He is making silo staves and sends a small crew out to build silos and bins, replacing steel structures. He also makes a high quality brick in white and pastel shades, chiefly buff and pink colors.

S. Dilnot, a consulting technologist from England, described a foam concrete in which he is interested. He gave a paper discussing the philosophy of lightweight building materials and showed specimens having a very fine bubble structure.

Though there are a number of methods of producing foamed concrete, only two have any practical use, according to Mr. Dilnot. These are the chemical method, in which aluminum powder mixed with the aggregate reacts with lime water to produce bubbles, and the other method is the use of preformed foam containing air. The latter method is preferred, Mr. Dilnot said, for a number of reasons, among them that temperature is not a factor in the reaction, faulty mixes can be corrected before casting of units, the mix can be pumped, the pores formed are spherical in shape and therefore show no directional characteristics, and because costs are lower. In contrast, just the opposite statements can be said about the chemical method. Autoclaving, the speaker said, permits the use of lime as a raw material and increases strengths and thermal insulation, whereas shrinkage is decreased.

Officers elected for the coming year are president, Elmer R. Coats, Mutual Materials Co., Seattle, Wash.; vice-president, Leo J. Ryan, Ryan Builders Supplies, Ltd., Windsor, Ont., Can.; and secretary-treasurer, Dale Cobb, Century Brick, Monroe, La.

N.C.M.A. Meeting

(Continued from page 196)

were guests of the Waylite Co. on a field trip to Bethlehem, Penn., to see the company's new lightweight slag expanding plant in operation. The guests were taken in buses to Bethlehem, and after a luncheon at the Bethlehem Club, a tour through Bethlehem Steel Co. was arranged. The visitors watched a blast furnace tapping, then the flow of molten metal and the skimming off of the floating slag into ladles. The slag expanding plant was next visited while it was in operation. Dinner and cocktails at the beautiful Saucon Valley Country Club topped off the day, though a nightcap was provided when the buses drove through the Waylite plant at night, affording a spectacular view of the brilliant flow of slag.

Cover-Coating Pipe

(Continued from page 198)

yard of 8 in. diameter and 40-ft. steel pipe is shown, after they were lined with cement mortar by the centrifugal process, and cover-coated with cement mortar by the Steam-Cote process.

When the steel pipe are used for subaqueous pipe lines, for river crossings and the like, they will float when empty. To provide the required weight to prevent buoyancy, the steel pipe are provided with a thick cover-coat, which is accomplished in one pass by the use of one or more additional gun units, and by winding one or more wire mesh reinforcements simultaneously with the coating. In Fig. 7 the pipe are being loaded for shipment in the steel pipe plant, from a large stock on hand. The Steam-Cote cover-coatings are not cracked in storage, and in handling.

Cover-Coating Prestressed Concrete Pressure Pipe

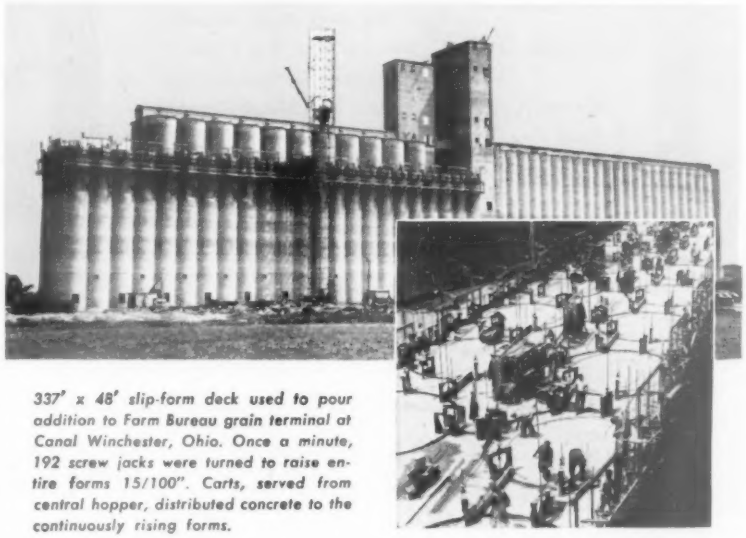
The new Steam-Cote process offers great possibilities for cover-coating prestressed concrete pressure pipe, after the concrete cores are stress-wound with high tensile strength steel wire. Ordinary Gunite is too slow and expensive; other methods now in commercial use are restricted and also expensive.

Prestressed concrete pressure pipe has an unlimited future in this country and there is no valid reason why this kind of pipe should not be manufactured and sold on an ever-increasing scale—because prestressed concrete pressure pipe has all of the advantages, and none of the disadvantages, of cast iron pipe, steel pipe or reinforced concrete pressure pipe of conventional design. Since the concrete cores of prestressed concrete pressure pipe are now manufactured with concrete of great strength, density and impermeability, the new coating process can be used extensively for cover-coating the concrete cores, after they are stress-wound with high tensile strength steel wire.

It takes years to get rich overnight

High standards of truck mixer design, guaranteed by the Truck Mixer Manufacturers Bureau, have over the years built architect and engineer acceptance for ready mixed concrete. Adherence to those standards protects the investment of every operator whose mixers or agitators bear the Bureau Rating Plate.

(Advertisement below is being read by your best customers in Architectural Record, Engineering News Record, Western Construction and Southwest Builder.)



337′ x 48′ slip-form deck used to pour addition to Farm Bureau grain terminal at Canal Winchester, Ohio. Once a minute, 192 screw jacks were turned to raise entire forms 15/100". Carts, served from central hopper, distributed concrete to the continuously rising forms.

How to pour a 1,200,000 bushel basket — in one piece

By a continuous pour of 6,000 cu. yds. of ready-mixed concrete, into slip-forms raised on jackrods at the rate of .15" every minute, this elevator addition was completed in 168½ hours. The 24 bins, each 20′ in diameter and 127′ high, and interstitial walls, covering a 337′ x 48′ area, form one monolithic structure without joint or seam.

Because concrete design envisions a homogeneous material, of numerous elements completely mixed, the ready-mixed concrete industry certifies by Rating Plate those truck mixers and agitators which have the proper design, capacity, drum speed, mixing action and water control necessary to produce a homogeneous concrete of uniform strength.

Look for this Badge of Dependability on Truck Mixers: You have a right to insist on this Rating Plate on any truck mixer that serves your jobs. It is available to all who comply with the quality standards established by the National Ready Mixed Concrete Association and the Truck Mixer Manufacturers Bureau.

These member manufacturers comply with Bureau standards:

BLAW-KNOX DIVISION Pittsburgh, Pa.	CONCRETE TRANSPORT MIXER CO. St. Louis, Mo.	THE T. L. SMITH COMPANY Milwaukee, Wis.
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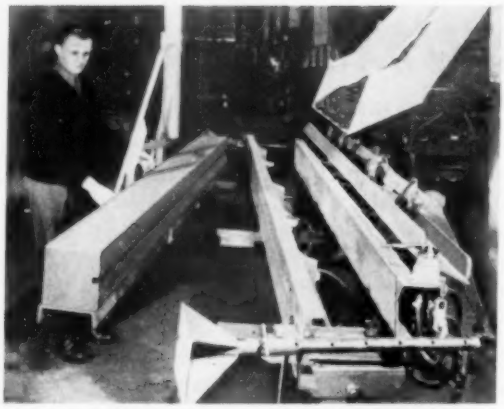

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Make lintels 7⅝" HIGH by 3⅝" 5⅜" 7⅛" 9⅛" 11⅛" WIDE in these lengths.

S 6	2'8" up to 6'
S 7	2'8" up to 7'4"
S 8	2'8" up to 8'8"
S 9	2'8" up to 9'4"
S10	2'8" up to 10'8"

STANDARD LINTELATORS
Make lintels 7⅝" HIGH by 3⅝" 5⅜" 7⅛" WIDE in these lengths.

No. 6	2'8" up to 6'
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No. 8	2'8" up to 8'8"
No. 9	2'8" up to 9'4"
No. 10	2'8" up to 10'8"

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Popular KENT LINTELATORS are economically producing lintels and sills in various lengths and sizes which satisfy the increasing requirements of builders everywhere.

With steel difficult to obtain there is an even greater than normal demand for these proven products.

Then, too, their lower "on the job" installation cost is a big factor to the builder, resulting in a greater ultimate profit to him.

Don't let another day slip by without getting the complete facts and figures on KENT LINTELATORS.

Write at once for the bulletins.

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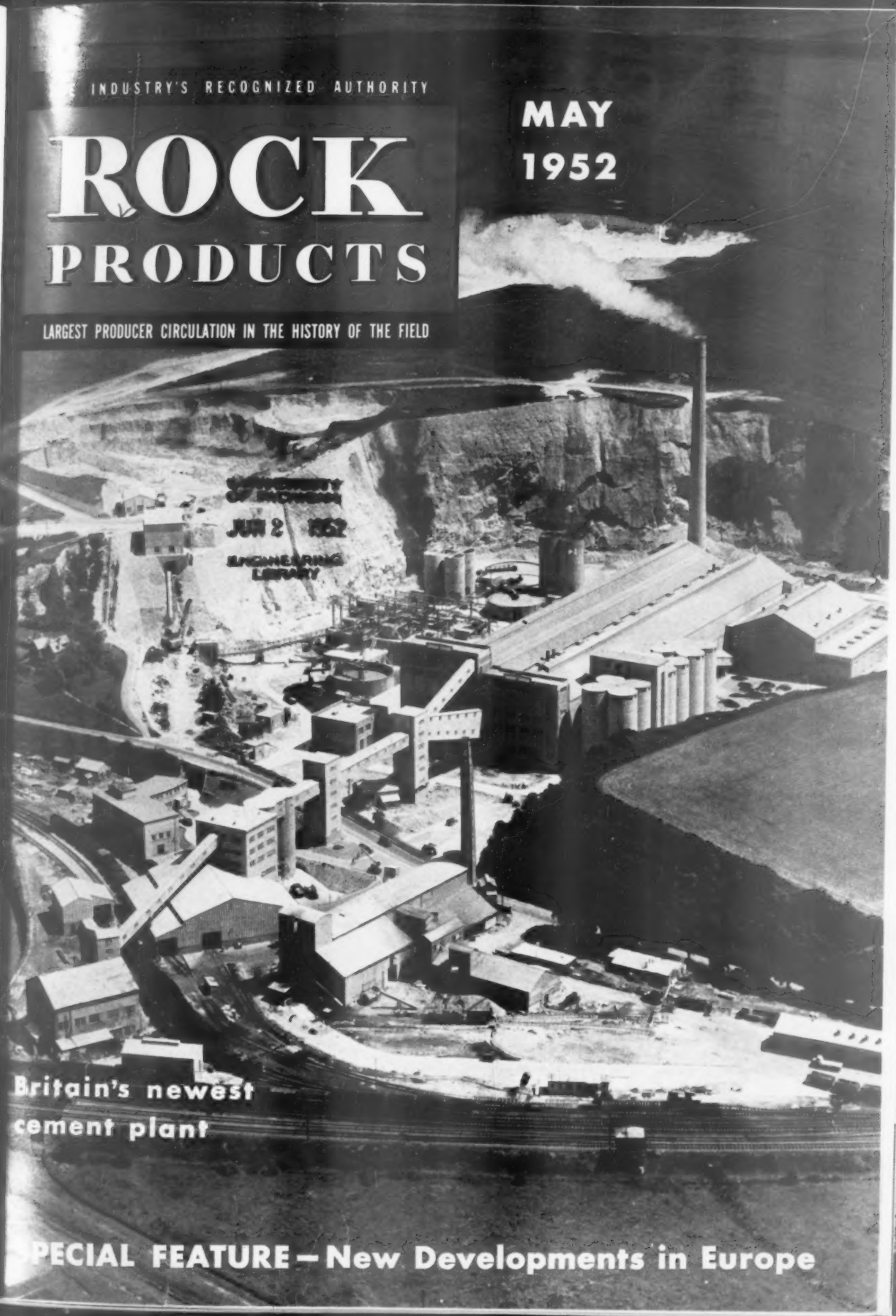

Britain's newest cement plant

SPECIAL FEATURE—New Developments in Europe

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